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## PREFACE.

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The first edition of this Manual was issued by the Calcutta Fire Insurance Association in 1906, and was brought up-to-date and reissued in 1930. The third edition was published jointly by the Insurance Associations of India and Pakistan in 1948, to provide for the needs of the whole of the areas controlled by those Associations and this is a fourth edition with slight amendments to the last publication.

The Manual should prove of value to Managers and Engineers of factories and premises in which Fire Extinguishing Appliances are installed and also constitute a handy book of reference to Insurance Officials when dealing with such matters.

The maintenance of Fire Extinguishing Appliances in an efficient state and familiarisation with all the details of the operation is essential if the maximum benefit is to be derived in the emergency of an outbreak of fire. The rules and recommendations are based on long experience, both in India and elsewhere in the World. It has been written in collaboration with the Fire Offices' Committee (Foreign), London who maintain an up-to-date laboratory for the testing of Fire Extinguishing Appliances. Co-operation and adoption of the rules will not only obtain an appropriate discount of fire insurance premiums, which will enable the capital cost of the appliances to be recovered, but will instil that feeling of security which the presence of an efficient fire fighting machine should engender. The direct loss from fire and the resultant wastage is always serious, but the indirect loss and the resultant dislocation of business is more often much more serious.

The Associations in Bombay, Calcutta and Karachi maintain an inspection staff of qualified Engineers, specialists in Fire Fighting and Prevention Engineering and practice in all its aspects. The services of this staff is available to make recommendations and carry out inspections upon payment of fees and expenses in keeping with the nature of the work.

It is not possible in so small a Manual as this to provide for every condition and exigency which may arise. It is therefore urged that, where the rules and recommendations herein are not sufficiently clear or adequate, further elucidation and assistance be obtained of the Association through your principal Insurance Company. The Associations do not correspond direct with Companies' clients.



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## SECTION 1.

### PROCEDURE TO BE FOLLOWED IN THE CASE OF APPLICATIONS FOR DISCOUNTS.

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NOTE —All references herein to Association Committee or Staff thereof apply to the Association controlling the territory within which the risk is situated.

The sanction of discounts off insurance premiums must necessarily follow consideration, by the Association of all details of the risk, and any manufacturing processes involved and the protective appliances to be installed in order to ensure that the standards laid have been fully observed. To prevent confusion or disappointment, definite rules for procedure have been laid down as follows :—

1. **Proposals for the installation of appliances** should be submitted to the Association by the Leading Office on the risk and should comprise :—

- (a) In the case of sprinkler and hydrant installations, fully dimensioned plans giving capacity and situation(s) of the pumping plant, position and details of valves, and details of water supplies, etc.

N.B.—Plans in triplicate are necessary for risks situated in Gujarat, Rajputana and Central India and in duplicate for all other risks under the jurisdiction of the Bombay Fire Insurance Association.

- (b) In the case of Internal Appliances, details of the areas of the various compartments, their occupation and the quantities and types of appliances proposed.

The prior submission of proposals to the Association is essential but does not dispense with the procedure laid down hereafter (Rules 2, 4 and 5) for application for the sanction of discounts, since it is very desirable to ensure that the installation will conform to the Association's requirements before work is commenced.

2. Applications for discounts must be submitted on special forms provided for the purpose by the Association and comprise :—

- (a) Application by the Leading Office
- (b) Schedule of appliances (signed by Insured)
- (c) Guarantee by the Insured where required.

} See appendices Nos. 1—4.

3. In every case a plan of the premises prepared in accordance with the Association's Rules on Page 1 must accompany any application for a discount for Fire Extinguishing Appliances and in the case of Sprinkler Installations, the following additional particulars are essential :

- (a) Installation (sectional and elevation) plans
- (b) Detailed report of the installation(s) on a form supplied by the Association.
- (c) A certificate of completion submitted by the Sprinkler contractor stating the pressure test to which the installation has been subjected and giving the date from which it was in complete working order.

} Usually prepared and furnished by the Sprinkler contractor.

4. Where the application relates to an extension of an existing service, the plan or plans must not only contain full details of the extension but must also show that portion of the premises which is adjacent to the extension and, in addition, the connections to the existing mains. It is further necessary to submit in respect of any extension a complete set of the forms detailed in Rule 2 above. (See appendices Nos. 1—4).

5. Applications which relate to discounts for Internal or Hand Appliances only, need not be accompanied by a plan of the premises, but the Association may, at their discretion, call for a plan to be submitted.

Copies of plans accompanying applications for discounts are filed by the Association and cannot be withdrawn without the sanction of the Committee.

6. No application for discounts can be entertained until the relative appliances are complete, in position, ready for use and fully operative and, subject to their being found in order on inspection, the discount or allowance will be sanctioned from date of receipt of the completed application (in accordance with Rule 2) by the Association. In the event of the installation

being found incomplete or defective, the discount will be withheld (or withdrawn if already notified) until the defects have been remedied to the satisfaction of the Association.

7. No allowance may be made for Fire Extinguishing Appliances until notified by the Association either by letter or circular, and then with effect only from the date specified in such notification.

8. Installations conforming to the schedule of requirements laid down by the Association will receive the appropriate discount.

9. When it is proposed to instal appliances not conforming to the standard rules and regulations and in respect of which discounts will be applied for, it is advisable to obtain prior sanction from the Association.

10. Proposals for the installation of appliances in risks not classified in the scale of discounts should first be submitted to the Association so that the appropriate rates of discount may be fixed.

11. Offices and the Insured are requested not to change block numbers as this naturally affects the Association's records and causes confusion. If block numbers have to be changed the Association should be notified at once.

## SECTION 2.

### SPRINKLER INSTALLATIONS.

1. A Sprinkler Installation has two important primary functions to perform, viz. to give the alarm of an outbreak of fire and to attack the fire at its inception. In many cases sprinklers effectively extinguish the fire by reason of their operation at an early stage of the outbreak, but other appliances are often necessary to deal with concealed spaces, ceilings and fires amongst large quantities of material.

2. To ensure efficient service, a sprinkler installation must be erected by an approved contractor, in order to ensure that it conforms to the regulations. Similarly, any alterations or extensions to an existing service must only be carried out by such a contractor.

NOTE.—Replacements and/or spare parts for an automatic sprinkler installation and the pumping set must be the products of a recognised manufacturer, but in certain instances and with the prior approval of the Association such requirements may be provided by the Insured.

3. The maintenance of an installation is equally important because unless the pumps, automatic regulators and switch-gear, valves and alarm gongs are kept in good condition, minor defects are liable to cause just that delayed operation in an emergency that may make all the difference. Indeed, unless an installation can be depended upon, it no longer serves its purpose and that false sense of security it creates is likely to be dangerous; certainly what might otherwise be a small fire may very easily become too extensive for the sprinklers to control.

4. The rules stipulate that the motive power for sprinkler pumps must be automatic, i.e. a regulator or automatic starting switch must be fitted which will ensure the pump coming into full operation when the pressure in the installation drops to a certain predetermined figure.

5. The regulations laid down in the following pages ensure a thoroughly efficient installation; but the periodical visits of the Association's inspecting staff should not be the only examination to which the mechanism is subjected. The person in charge of an installation should make, at least, weekly tests and these should be recorded on a card or in a book kept specially for the purpose.

### SECTION 3.

## REQUIREMENTS FOR AUTOMATIC SPRINKLER INSTALLATIONS.

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NOTE :—Rules relating to particular classes of Risks are printed in red ink.

### BUILDINGS TO BE PROTECTED.

1. Every portion of a building and of every building directly communicating therewith, or adjoining and not having a party wall carried up to the roof and, in the case of non-fireproof buildings, other than sheds, through the roof, must be protected by sprinklers, **except**:

- (a) Fireproof buildings, stories, room or compartments not communicating with the sprinklered building otherwise than by a fireproof door or doors.
- (b) Non-fireproof buildings or rooms not communicating with the sprinklered building otherwise than by double fireproof doors, (i.e. in a perfect party wall carried through the roof).

NOTE :—In the case of storied buildings (except Cotton Mills) fireproof floors and ceilings are not deemed to be perfect separation.

- (c) Staircase and W. C.'s constructed of brick, stone, concrete, and/or iron enclosed by walls or brick-work, masonry, and/or cement concrete reinforced or otherwise all window openings therefrom being protected either by wired glass (fitted according to the Rules of the Association) or by a sprinkler fitted in the staircase immediately over each window, and all other openings therefrom being protected by doors.

If a staircase constructed in other respects as described has a non-fireproof ceiling over the top landing thereof, with or without a store-room or store-rooms above, only such non-fireproof ceiling and/or store-rooms (if any) need be sprinklered.

- (d) Sheds in " non-hazardous occupation " only and having a fireproof floor (or a wooden floor resting on a fireproof surface without cavities) provided every opening from the sprinklered building be protected by a fireproof door or by a sprinkler or sprinklers placed in the shed in close proximity to every such opening (see Note to 1(f)).
- (e) Sheds other than as above, provided every opening from the sprinklered building be protected by a fireproof door and that a sprinkler or sprinklers be fixed in the shed over every such door.
- (f) Any fireproof room or portion of a fireproof room in non-hazardous occupation only, communicating only with the sprinklered building by doors or windows in a brick or stone wall, provided every such door or window be protected by a sprinkler or sprinklers placed in the un-sprinklered room in close proximity to the openings.

Note applicable to (d) and (f) Under exceptions (d), (f), only sheds or fireproof stories occupied for storage purposes may be regarded as in non-hazardous occupation except as follows :—

- (i) Cotton and other Textile Spinning and Weaving Mills—Including also any process after spinning, except drying by artificial heat, other than drying of yarn or cloth on steam heated cylinders and/or ballooning.

(ii) Shipbuilders, Metal Workers and Wood Workers.—Include only metal working and/or the storage of incombustible materials.

There must be no galleries or lofts, and in the case of a shed, the shed must be built of brick or stone with roof of slates, tiles or other incombustible material, or constructed of iron on wooden framework without wood linings.

Wooden louvres and glass roof lights in the roof allowed.

NOTE.—Walls constructed of metal protected with a coating of bitumen, tar or pitch, or with material impregnated or treated with bitumen, tar or pitch are not to be regarded as iron construction.

Linings of composition boards or sheets of wood pulp, vegetable fibre or other combustible material are to be deemed "wood linings".

(iii) Flax Warehouses :—

Exceptions (d) and (f) not applicable.

(g) Silos or Grain Bins inside buildings forming part of Corn Mill, Oil Mill or Distillery premises.

(h) Sheds of fireproof rooms used mainly for wet processes.

(i) Ovens, hovels and kilns in Potteries, including Earthenware, Brick, Tile and Glass Works.

(j) Rooms, compartments or towers conforming to one or other of the following descriptions and used for no other purpose than to house electric switch-gear or other electrical apparatus.

(i) Sheds Towers or Fireproof Rooms. Communicating with the sprinklered premises only by doors or windows in a brick or stone wall and having the communications protected either by fireproof or hardwood doors or shutters or wired glass or by sprinklers fixed within twelve inches of the wall, either inside or outside the room, tower or shed.

(ii) Compartments contained in a Non-Fireproof Room. Having either (a) the top of the compartment at least two feet below the ceiling so as to permit of a free distribution of water from sprinklers above, or (b) the ceiling of the compartment of incombustible construction or

underdrawn with sheets of asbestos, or a composition of asbestos and cement, at least 3/16 inch thick, or with iron or steel plates or sheets, in all cases overlapping at the joints and firmly held in position by screws, and a line of sprinklers within 12 inches of the enclosing partitions.

(iii) Compartments contained in a Fireproof Room. Having either (a) enclosing walls of brick, stone, iron or concrete with a fireproof or hardwood door or iron or metal covered shutter or wired-glass to every opening, or (b) a line of sprinklers fixed (either inside or outside the compartment) within 12 inches of the enclosing partitions.

NOTE 1 :-- As an alternative to sprinklers or to doors, shutters or wired glass where called for under (i), (i), (ii) and (iii), protection may be afforded by either (a) open window drenchers controlled by a lever and weight equilibrium valve normally kept closed by a wire cord containing fusible links inserted in the positions where sprinklers would have been fitted in the electrical room or compartment had the latter been sprinklered in the ordinary way ; or (b) distributing jets of multiple-jet sprinklers having the controls spaced inside the room or compartment.

NOTE 2 :-- If the cubical capacity of the compartment, tower, room, or shed exceeds 1,000 feet it must contain ordinary fire extinguishing appliances.

(k) The underside of screens or shields erected over the wet ends of Paper Making Machines.

(l) Over Salt Baths and Metal Melt Pans, where the access of water to the contents would endanger personnel. No water pipes should be fitted in such positions.

2. It is strongly recommended that, where practicable, any building or buildings, constructed otherwise than of brick, stone, concrete or iron and situate within 30 feet of any sprinklered building having windows or other openings opposing or overlooking, be protected (whether communicating with the sprinklered premises or not) if the capacity of the said building or buildings either separately or in the aggregate exceeds 5,000 cubic feet. The presence of such if left unprotected may prejudice the sprinkler discount.

3. Tanneries—In all rooms in which leather is dried on Tannery premises the protection must be on the multiple jet system. This requirement shall not apply in the case of fire-proof rooms in which

- (a) a clear space of at least three feet is maintained throughout the room between the (deflectors of the) sprinklers and the tops of the) hides or skins.
- (b) the sprinklers are spaced on the basis of at least one to each 64 square feet of floor area, the sprinklers being not more than 8 feet apart, nor more than 4 feet from walls.

#### SECTION 4.

#### SPRINKLER HEADS.

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1. Sprinklers must be of a type approved by the Association and must be suitably arranged on distributing pipes supplied with water in conformity with the rules.

2. It is necessary always to maintain a supply of spare heads on the following scale.

Where the total number of heads in the installation does not exceed :—

2000 in all   ...   ...  
Over 2000   ...   ...

	For risks within a 60 mile radius of Calcutta and Bombay.	For all other risks
2000 in all   ...   ...	25	50
Over 2000   ...   ...	50	100

In cases where groups of risks are in close proximity and are under one control, the reserve supply of sprinkler heads may be reduced with the prior sanction of the Association.

#### SECTION 5.

#### PROTECTION OF CONCEALED SPACES.

---

1. The spaces between the ceilings and roofs, either at the apex or at the sides of buildings, must be efficiently protected.

2. Where extensive concealed spaces exist between floors and ceilings below, and exceed 2 feet 6 inches in depth and not wholly formed of incombustible materials without any wood-work contained therein, they must be fitted with sprinklers unless full particulars be submitted and the approval of the Association be obtained for the omission of sprinklers.

## SECTION 6.

### HOISTS, ELEVATORS, GEARING BOXES, ETC.

---

1. All hoists, elevators, shoots, rope or strap races, non-fireproof W. C.'s, gearing boxes and non-fireproof staircases whether fitted with risers or not (including the undersides), inside or communicating (otherwise than as allowed in Section 3) with sprinklered buildings, must be protected by sprinklers, and except in the case of Corn Mills and Distillery premises used for (Malt Grinding, where there is any opening in the floor for) ropes, belts, shafts, or straps there must be a sprinkler fixed so as to command such opening.

2. A sprinkler or sprinklers must be fitted so as to protect the ceilings immediately above all countershafts. These sprinklers must be fixed in positions out of the line of flight of breaking straps and must be protected by stout metal guards unless strap guards are provided.

3. All exhaust trunks for collecting dust or refuse (except those constructed of incombustible materials in textile mills only) must be protected by placing a sprinkler inside the trunk on the delivery side of the fan.

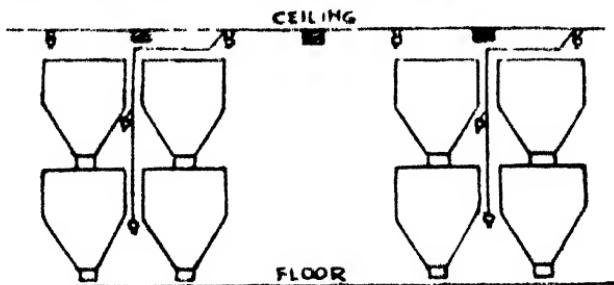
4. In the case of Corn Mills, Oil Mills and Distilleries, there must be at least one sprinkler.

- (a) In the box of every elevator, so placed as to command the head and both the legs or shafts of the elevator.
- (b) at the head of every dust trunk or spout, and
- (c) inside the dust trunk or spout connected with every exhaust fan either independent or forming part of any machine other than a Middlings Purifier collecting its own dust,

the sprinkler in every instance to be fixed on the delivery side of the fan and close to it.

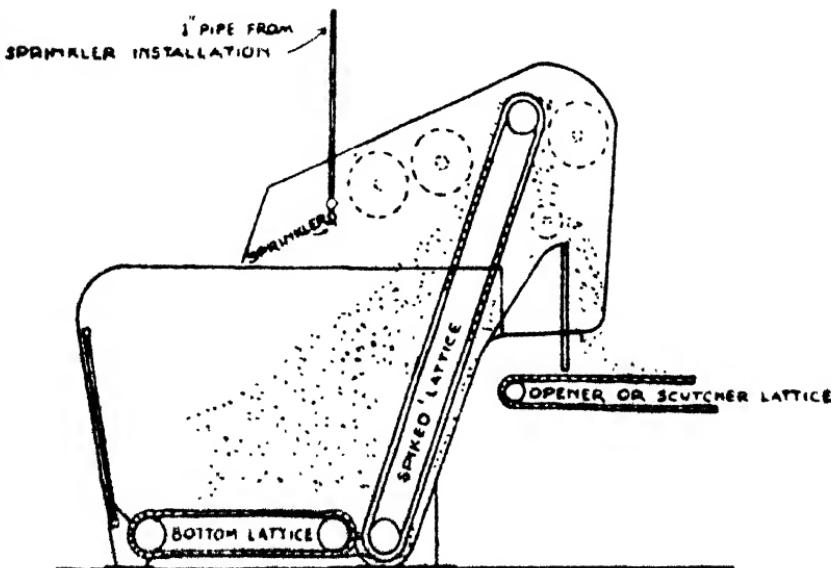
5. All dust trunks constructed of combustible material more than 30° out of perpendicular must also be protected

with sprinklers fixed inside the trunks at intervals of not more than 10 ft. from each other. When the centrifugals and similar machines are placed one above another in tiers, as in the diagram below and are less than 3 ft. from each other, sprinklers must be placed in the spaces as shown.



6. All bins exceeding a cubical capacity of 1,000 feet for the storage of flour, bran or other material which has undergone any process of reduction must be internally protected by sprinklers.

8 COTTON MILLS A SPRINKLER MUST ALWAYS BE FITTED  
INSIDE THE TOP COVER OF HOPPER-FEEDER MACHINES, AS  
SHOWN BELOW:-



7. In the case of buildings on Oil Mill premises, Oil Storage Tanks must be wholly covered in and Oil Process Tanks must be covered in as far as practicable so as in each case to exclude water from sprinklers above, and the covers must be so designed that water falling thereon will flow on to the floor. Oil Tanks having their bases raised more than 12 inches above the floor level must be protected by sprinklers on the undersides, unless any spaces thus formed are enclosed at the sides by incombustible material.

## SECTION 7.

### WATER SUPPLIES.

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1. Sprinkler installations must be provided with two separate, independent and adequate sources of water supply always available, one at least of such sources being practically unlimited, and one automatic.

2. The following are accepted sources of Water Supply.

- (a) A pump drawing from a supply of at least 100,000 gallons which must always be available to the pump suction at all seasons of the year solely for the sprinkler service (or in the case of large risks equipped with a hydrant service, a supply of not less than 350,000 gallons for both sprinklers and hydrants) including any inflow water which would be available throughout a period of four hours.
- (b) Elevated Tank (see Section 8).
- (c) Pressure Tank (see Section 9).
- (d) Elevated Private Reservoir.

3. An elevated Private Reservoir must not be accepted as a supply until it has been approved by the Association.

4. In all cases where a suction tank or jack well is used as an unlimited supply to a pump, the main feeding the suction tank must be capable of maintaining the water in the tank at a constant level when the pump is working at full capacity or alternatively of delivering in four hours a quantity of water which, added to that contained in the tank, will equal 100,000 gallons.

5. Where the water supply has fibrous or equally objectionable matter in suspension or mud and/or sand, liable to cause accumulation in the installation(s), the pump suction(s) must be installed in a jack well or suction tank fitted with a

sluice valve or other approved arrangement which admits of the water supply being shut off for the purpose of cleaning the pump suction(s) with the minimum of delay.

## SECTION 8.

### ELEVATED TANKS.

---

1. Elevated tanks must have their base at least 15 feet above the highest sprinkler, and must have a capacity of not less than 7,500 gallons unless the base be 20 feet or more above the highest sprinkler, in which case a capacity of 5,000 gallons will be accepted.

2. The tank must always be kept full of water, except when its capacity is in excess of the sprinkler requirements, in which case the excess may be drawn off for other purposes. The outlet for that purpose, and also for any overflow pipe (which should be at least 4 inches in diameter) must be taken out of the side of the tank and at such a height above the bottom that the quantity of water in the tank cannot be reduced by such means below the specified quantity required for the sprinklers. The feed pipe to the tank must have a minimum diameter of two inches, with a ball valve fitted at the tank end and a stop valve near ground level in an accessible position which normally should be locked open.

3. The tank must be fitted with semaphore indicator showing the depth of water therein, the water must be kept clean and free from sediment, and the tank must be cleansed at least once every year when it must be painted inside, should this be necessary to prevent corrosion. It is desirable that the opportunity should be taken at this time to examine and overhaul all alarm and back pressure valves and stop valves as called for in Section 14 para 13.

4. A substantial permanent ladder or stairway extending above the top of the tank sufficiently to permit of easy access must be provided.

5. Provision must be made where necessary to prevent the water in the tank from freezing, and a tank not wholly enclosed within a tower must be covered in at the top in such a manner as to exclude daylight and solid matter.

6. The use of one tank to supply installations in two or more buildings under separate ownership is not allowed.

N.B.—See Section 14 para 8 for conditions regarding stop valves on elevated tank delivery pipes.

**SECTION 9.****PRESSURE TANKS.**

1. Pressure tanks must be fixed inside a protected building or in a building of fireproof construction used for no other purpose. They must conform to one or other of the descriptions in the following table :—

Capacity of tank or tanks.	Quantity of water to be contained.		Minimum air pressure to be maintained in tank or tanks when the base is on a level with highest sprinkler.	Add for each foot or part thereof which the base of tank or tanks is below highest sprinkler.
	Proportion of capacity.	Not less than		
5,000 gls.	$\frac{2}{3}$ rds	3,333 gls.	75 lb. per sq. in.	$1\frac{1}{2}$ lb. per sq. in.
6,666 ..	$\frac{1}{2}$ ..	..	45 .. ..	1 .. ..
10,000 ..	$\frac{1}{3}$ ..	..	30 .. ..	$\frac{1}{4}$ .. ..

2. The tank must be fitted with an air pressure gauge as well as with gauge glasses to show the level of the water, and the stop taps on the latter should be kept shut. There must also be a stop valve and a back pressure valve on the pipe feeding the tank with water, also on the pipe through which air is pumped into the tank, and these valves should be fixed close to the tank. The pressure tank should be examined thoroughly every three years, when it should be cleaned and painted, both internally and externally, if necessary.

3. Any safety valve fitted to an air pressure tank must be of an approved type, fixed in such a manner as to provide a water seal to the valve seating. A connection to the valve from the air space above the water line should be provided to permit the rapid escape of air in the event of the valve coming into action.

4. The setting of the valve for the correct working pressure must be done by the installing engineers, and the valve must be so constructed that it can be tested without the setting being interfered with. Whether the valve be of the lever and weight or spring type, the setting mechanism must be protected against tampering by unauthorised persons.

5. The outlet from the relief valve must be an open end, so that any leakage which may occur can be readily detected.

6. The use of one tank to supply installations in two or more buildings under separate ownership is not allowed.

## SECTION 10.

### SPRINKLER PUMPS.

1. The motive power for sprinkler pumps (which must be automatic) must be available at all times and capable of driving the pumps at full rated capacity.

2. In all cases where steam-driven pumps are fitted an auxiliary boiler-feed pump must be fitted in addition in the sprinkler pump and risks having one boiler only cannot qualify for a discount for the sprinkler installation.

3. Pumps must be fitted in an easily accessible position where they are not liable to be damaged by fire or other causes and a 2-inch valve and pipe for testing purposes must be fitted on the delivery pipe close to the pump.

4. Plunger pumps must be either triple or quadruple acting and must have a capacity :—

When the number of sprinklers

	gallons
	per minute
does not exceed 100	500
does not exceed 2500	625
exceeds 2500	1,000

The capacity must be calculated on a plunger speed not exceeding 150 feet a minute for each plunger and the diameter of the suction pipe must not be less than that of the pump plungers.

4A. Pumps must be capable of delivering water at a pressure of 100 lbs. per square inch or 230 feet head, but in the case of installations for shed buildings the pump delivery pressure may, subject to the prior approval of the Association, be not less than 77.9 lbs. per square inch or 180 feet head.

5. Pumps of any other type must have the same output per minute as required by the above table for plunger pumps. The diameter of the suction pipe must be such that the rate of flow of water through same will not exceed 300 feet per

minute when the pump is delivering the maximum quantity of water required by the Rules. If, however, the pump be situated below the level of its water supply, the diameter of the suction pipe may be based upon a rate of flow of 400 feet per minute.

NOTE :—The above requirements as to the diameter of the suction pipe do not apply in the case of a pump drawing direct from a town's main (as in the case of a so-called "booster" pump).

6. It is necessary that each fire service pump (i.e. sprinkler and hydrant pumps) be provided with an independent suction pipe, and where possible, the suction pipe(s) should be installed in a jack well fed through a culvert from the main water supply. At the main water supply end of the culvert, a sluice valve or gate must be fitted.

7. The ratios of the aggregate effective areas of the suction and delivery valves of plungers pumps to the area of the water plungers must in no case be less than 50 per cent and 33 per cent respectively.

N.B.—The term "aggregate effective area" is intended to convey that the minimum percentages specified apply not only to the net aggregate area of the valve ports, but also to that of the annular lift of the clacks or valves.

8. The automatic regulator must be set so that the pump will accelerate its speed when the pressure at ground level falls below 60 lbs. per square inch.

9. Pumps must take water from a practically unlimited source (see Section 7, Rule 2(a)).

10. Pumps must be driven by steam or electricity. If, however, full particulars be first submitted to the Association, the use of petrol, motor spirit, and compression ignition type engines may be permitted, provided the conditions specified in Appendices VII and VIII respectively, are complied with and the arrangements generally are approved.

11. Pumps must be automatic and except in the case of the centrifugal type they must be either constantly moving or so arranged that they will automatically come into operation at least once every 4 hours. The steam cylinders of automatic pumps must always be kept warm and an efficient draining arrangement be provided.

12. Each pump must be provided with a plate giving, in the case of reciprocating pumps, the diameter of the steam cylinders and water plungers and the length of stroke, also

the ratios of the effective aggregate areas of the suction and delivery valves to the area of the water plungers ; and in the case of centrifugal pumps, the lift, the capacity in gallons per minute and the number of revolutions per minute.

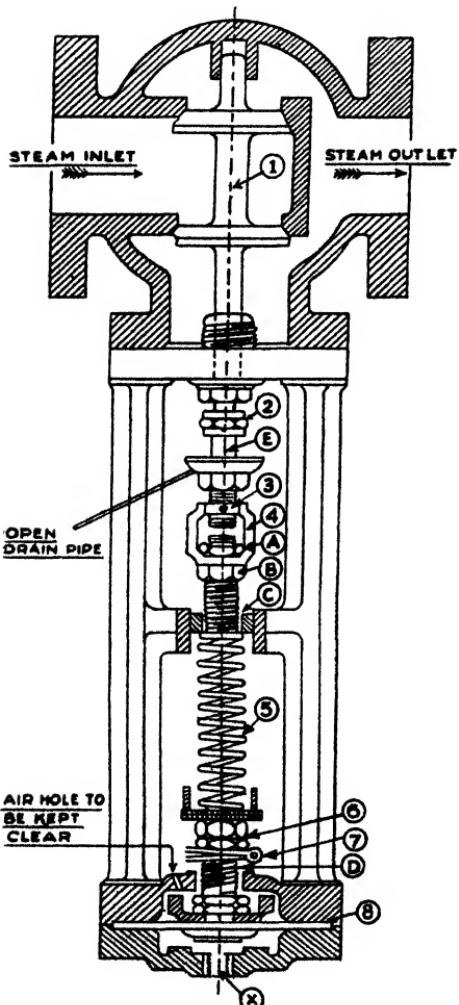
13. When the pump is above the level of its water supply there must be a foot valve, also a ' priming ' arrangement, which latter must consist of a metal pipe (having a minimum internal diameter of 4 inches in the case of centrifugal pumps and 2 inches in the case of other pumps, with in each case a stop valve thereon of the same size) permanently connected to the pump and to a tank or other water supply always available, the capacity of which must be at least three times that of the suction pipe from the pump to the foot valve.

14. Where circumstances permit, centrifugal pumps should preferably be fixed below the level of the water supply, and if automatic in action must be so fixed, unless the priming arrangements are such as to ensure that the suction pipe shall be automatically maintained full of water notwithstanding a serious leakage therefrom (the pump being automatically brought into action to replenish the priming tank should the latter be drawn upon at a greater rate than the rate at which it is fed from any other source). Where the arrangements are of this character the capacity of the priming tank need not exceed 100 gallons and the diameter of the priming pipe need not exceed 2 inches. The arrangements must be such that they do not afford any outlet through which pressure tank or gravity tank water could pass, directly or indirectly, into the pump suction pipe.

15. Water for priming purpose must not be taken from the sprinkler tank or installation, with the exception that where the capacity of an elevated tank is in excess of requirements the excess may be drawn upon as provided by Section 8: para 2.

# AUTOMATIC STEAM REGULATOR FOR SPRINKLER PUMP

## DIAGRAMMATIC DRAWING AND INSTRUCTIONS ON SETTING VALVE AND MAINTENANCE OF REGULATOR.



### IMPORTANT.

Keep the regulator clean and this will greatly assist in maintaining it in good working order.

### TO SET VALVE.

1. Slacken both nuts A. & B.
2. Start pump and raise pressure to 60 lbs. per square inch at the Chamber X.
3. Lift Valve Spindle E until the double beat valve 1 closes on its seating.
4. In the above position tighten nut B against Link 4.
5. Also tighten nut A against Link 4.

### MAINTENANCE.

1. Method of grinding in double beat valve 1.
  - (a) Grind in top and bottom valve faces simultaneously and when completed clean both faces and seats.
  - (b) Apply a little more grinding paste to the top seat only and grind valve in again. The extra grinding of the top seat will allow for the greater expansion of the valve over the chest when heated up.
2. Ensure that the gland 2 has good packing and does not bind the Spindle E when tightened up.
3. See that the cotter pin 3 is fitted in the pin hole through the Link 4 and Valve Spindle.
4. Ensure that bushes C and D are kept clean to allow the spindle to work freely.
5. The double springs 5 are designed to coil in opposite directions to avoid the tendency of the spindle to turn while the valve is in operation. These springs should be adjusted to allow the split pin 7 to be fitted in the hole through the spindle below the check nut 6.
6. When fitting a new Diaphragm 8 the canvas side should be to the top and the rubber side to the bottom.
7. If water leaks through the air hole in the top of the diaphragm chest it indicates that the Diaphragm 8 is either leaking or badly fitted (keep a spare diaphragm in stock.)
8. Steam reducing valve for the sprinkler pump should be set to pass steam at 60 lbs. per square inch pressure.

**SECTION 11.****ELECTRICALLY DRIVEN FIRE PUMPS FOR  
HYDRANT AND/OR SPRINKLER INSTALLATIONS**

1. A warranty must be given that sufficient power is always available to drive the pumping set or sets at all times throughout the year.

2. Full details of the electric supply must be furnished together with details of generating plant.

3. The electric supply to the pumping sets must be entirely independent of all other electrical equipment in the premises and must not be interrupted at any time by the main switch controlling the incoming supply to the premises.

4. In all cases the arrangements in connection with electrically-driven pumps, automatic or non-automatic, must be such that when the main switch controlling the supply of current to the premises is open, power must still be available (either by way of a connection taken from the supply authority's side of the main switch or from some other source) to drive the pump. Where the pump is automatic in action the power must continue to be automatically available thereon (i.e. without requiring the manual operation of any other switch or mechanism). A suitable lamp or other indicator to be provided to show when the supply is "on" or "off" at the starting switch.

5. Automatic pumping sets must continue to operate, when necessary without the necessity of operating an emergency switch.

6. The pumping sets must be of the direct coupled type mounted on a robust bedplate, and must be free from vibration at all conditions of load.

7. The motors must be of the drip-proof type having the air inlet and outlets protected with meshed wire panels to exclude rodents, reptiles and insects.

8. The rating of motors and switchgear must conform to the relevant British Standard Specifications for continuously rated machinery and must have winding specially impregnated with heat and moisture resisting varnish to withstand tropical conditions.

9. Motors wound for high tension supplies must have a suitable fixed warming resistance to maintain the motor windings in a dry condition at all times and particularly under

monsoon conditions. The resistance must be connected to the lighting or equal circuit.

10. The pumping sets must be mounted in a separate building of fireproof construction or in a position approved by the Association and where they are below ground level heating apparatus must be provided when necessary in order to maintain the motor(s) in a dry condition, while adequate arrangements for draining the pump house must also be provided.

11. Automatically operated pumping sets must be provided for sprinkler installations and " boosters " of water main services.

12. Switchgear must be iron-clad and of robust construction.

13. An approved automatic circuit breaker having overload trips and/or starting unit must be mounted near to the pumping set. An ammeter must be placed in the main circuit near the motor to register the current and must be clearly marked to show the maximum full load current.

14. The circuit must be protected at the origin by an approved automatic circuit breaker having overload trips.

15. Cables for motors and switchgear must be armoured or be enclosed in heavy gauge screwed steel conduit according to conditions. Overhead lines are not permitted within 20 feet of any window, door or other opening in (a) any of the protected buildings, or (b) any other building within 50 feet of a protected building.

16. Equipment throughout must be painted red or equally distinctive colour.

17. Necessary spare parts, including a set of fuse holders (where fuses are employed) must be kept in readiness at all times.

18. The pumping sets must be worked for at least 15 minutes each week.

19. The wiring rules of the Association must be complied with in all installations.

20. A power station or sub-station supplying power for fire pump circuit must be so placed so that any falling masonry, etc., from other buildings occasioned by fire or other cause, cannot damage the station and so cut off the power to the fire pump circuits.

This rule applies to all new stations and any existing stations that can be reasonably made to comply.

N.B.—The requirements of regulations Numbers 3 and 4 may be amended in certain applications but complete details must be first submitted to the Association, who will consider each case on its merits and notify the leading office of their findings.

## **SECTION 12.**

### **SPRINKLER MAIN PIPES.**

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1. Trunk Mains must be of the flanged type (B. S. Specification) and hydraulically tested to a pressure of 174 lbs. per square inch.
2. All holes to be drilled, the drilling of each flange to be to B. S. Specification, and all bolts and nuts must be to Whitworth standard.
3. Flanges to be faced and to have jointing of rubber insertion or asbestos compound. The joints must be capable of withstanding a pressure of 174 lbs. per square inch.
4. In new mills, or in the case of extensions, it is recommended that, where practicable, the trunk mains be above ground, carried on supports in the open culvert(s) which usually circle the buildings.

## **SECTION 13.**

### **PRESSURE GAUGES.**

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1. To all installations there must be a pressure gauge fixed above the alarm valve, and another below the alarm and main stop valves.
2. A pressure gauge must be fitted on the delivery pipe from the pump and on the pump side of the back pressure valve.
3. A stop cock must be provided for each pressure gauge and a brass union fitted between the cock and the gauge.

**SECTION 14.****VALVES AND SUPPLY CONNECTIONS.**

1. No section of any installation may have more than 1,250 sprinkler heads but an installation of that number or less need only have one main stop valve which, when closed, will shut off all supply of water to the installation. For normal working conditions this valve must be secured open with a rivetted or padlocked leather strap.

2. All the water supplies must be connected before passing through the main stop valve, and each water supply must be fitted with a back pressure valve. When it is necessary for a back pressure valve to be fitted beneath the surface of the ground the position of the valve must be indicated and an inspection chamber must also be provided.

3. All main stop valves must be placed near ground level and must be properly protected from the action of frost (in those parts of India where the temperature is low during the cold season) and from being tampered with, but must be readily accessible to authorised persons. The customary method of protection is by means of a locked wooden or steel box with a glass or expanded metal front built to contain each stop valve and the other valves mentioned in (4) and (5).

4. Each installation must be provided with a waste valve not less than two inches internal diameter at any part and must be taken from a point near to the main stop valve. Not more than two bends may be used on a 2-inch waste pipe (as distinct from the waste valve itself) and if a greater length of piping than 10 feet be required the extra length must have an internal diameter of at least 3 inches.

5. All alarm and/or air valves must be of a pattern approved by the Association, fitted on the main supply pipe close to the stop valve and before any connection is taken off to supply any part of an installation.

6. Except as provided in paras (7) and (8) subsidiary stop valves or shut-off cocks are not allowed on any supply pipes.

7. In special cases small shut-off cocks may be allowed on the supply pipes to sprinkler heads fixed inside wheel boxes and gearing towers. The cocks should preferably be of the plug type with fixed handles.

8. In the case of elevated tanks a stop valve must be fitted on the delivery pipe but this valve must be placed close

to the back pressure valve and on the tank side thereof. It must also be secured open with a riveted or padlocked leather strap.

9. Stop valves may also be permitted on connections from the automatic pumps provided they are secured open in the same fashion.

10. All stop valves must be "right handed", i.e. they must be so constructed that in order to shut the valve the spindle must turn from left to right. There must also be an indicator which will show whether the valve is open or shut.

11. A plan of the risk with the position of the main stop valve or valves clearly indicated thereon must be affixed in a convenient place of the premises so as to be readily visible to the person responding to the alarm.

12. In cases where the stop valve or valves are situated within the building a location plate must be fixed on the outside of the external wall as near to the stop valve as possible bearing in raised letters.

Sprinkler  
Stop Valve  
inside.

These words should be in letters of at least 3 inches and it is recommended that the words be painted in white on a black ground.

13. All alarm and back pressure valves must be taken to pieces and thoroughly overhauled at least once in every three years and all stop valves must be maintained to work freely.

### **ALARM.**

14. Every Installation must be fitted with an approved automatic alarm signal to give notice as soon as any sprinkler is opened. This must be properly protected and tested at least once a week.

### **SECTION 15.**

## **MAINTENANCE OF SPRINKLER INSTALLATIONS.**

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1. The installation controlling valves must be properly protected and the alarm tested at least once per week. These valves together with all back pressure valves must be taken





to pieces and thoroughly overhauled at least once every three years. All valves must be maintained to work freely.

2. **Examination of Sprinklers.** Every sprinkler in Corn Mills, Oil Mills and Buildings on Distillery premises used for Grain or Malt Grinding, must be examined at least once a week and all dough and other accumulations removed therefrom.

3. **Protection against Corrosion.** All pipes and fittings must be thoroughly cleaned and given two coats of good quality paint of which the first must be a red lead primer. Prior to erection the pipes and fittings must have a coating of anti-corrosive paint. Care must be taken that the sprinkler heads are not painted.

4. **Sprinklers.** must be vaselined before erection and again when in position and thereafter at periodical intervals as when necessary, but only after removal of the old vaseline and thorough cleaning. Sprinklers of the "glass bulb" type need not be vaselined provided the body and yoke are treated with an anti-corrosive coating.

NOTE :--Although this treatment will materially lengthen the effective life of installations specially subject to danger of corrosion, it will probably be found necessary to renew the coatings from time to time at intervals varying according to the conditions.

5. **Sprinkler Piping.** Sprinkler pipes must not be used to obtain leverage when hoisting or removing goods and so far as practicable they must be so placed as to make such use impossible.

6. No stocks or materials of any description may be stored within 3 feet of any sprinkler head throughout the entire ceiling area, in any godown or other building protected by a sprinkler installation and storage guide lines should be painted around the walls inside the building.

7. Water in the installations must be changed at least once every six months to prevent an accumulation of sediment collecting in pipes and restricting orifices and retarding the flow of water to sprinkler heads in the event of their opening during a fire.

8. **Elevated Tanks.** The water must be kept clean and free from sediment, and the tank must be cleaned at least once every year when it must be painted inside should this be necessary to prevent corrosion, it is desirable that the opportunity be taken at this time to carry out any necessary repairs to installation controlling valves, back pressure and stop valves.

9. **Pressure Tanks.** must be examined thoroughly once every three years when they must be cleaned and painted both internally and externally, if necessary.

10. **Pumps.** Pump glands both steam and water must be maintained in efficient working condition and the packing renewed as required. In the case of steam driven sprinkler pumps, the steam stop valves on either side of the automatic regulator must always be kept in the full open position.

In the case of centrifugal pumps, care must be taken that the pump priming tanks are always maintained full of water.

11. Pumps and all working parts must be kept clean and lightly oiled as cleanliness greatly adds to efficiency. Any necessary repairs must be put in hand and carried out immediately.

12. In case of steam driven reciprocating pumps, small parts such as snifting valves cushioning valves and pet cocks must have special attention because faults in these valves cause the pump to knock badly and lose efficiency.

13. Suction and delivery valves must be examined at regular intervals particularly where sand or other objectionable matter is liable to be drawn through the pump suction.

14. **Spare Gear.** For steam reciprocating pumps a minimum of two sets of piston and bucket rings must be provided.

15. **Quarterly Inspection Reports.** In the case of risks situated in the Mofussil, the Insured must submit to the Association, through the Leading Office on the risk, completed Quarterly Inspection Reports (see Appendix VI—copies of which are obtainable from the Association) on or before the last day of January, April, July and October, of each year.

## SECTION 16.

### MEASURES TO BE TAKEN WHERE AN INSTALLATION IS FOR ANY REASON TEMPORARILY INOPERATIVE.

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1. Notice must reach the Association through the Leading Office on the risk, in other than emergent cases as provided for in Clauses (4) and (5) hereafter mentioned, at least three days before the work is commenced thereon and final sanction obtained for the purpose.

2. Alterations and/or additions to the installation or its water supplies must be carried out during day-light as far as practicable, and all expedition must be used so that the installation may remain inoperative as short a time as possible. The water must be turned on again as soon as the alterations or repairs are completed.

3. Before water is turned off at the main stop valve a thorough examination of every part of the premises must be made to ascertain that there is no indication of fire.

4. When an installation is rendered inoperative whilst the ordinary work of the premises is being carried on, foremen or heads of departments must be notified, so that, in case of fire, the best possible use may be made of the other effective fire extinguishing appliances.

5. When a sprinkler installation is rendered inoperative outside working hours, before the water is turned off, all the other effective fire extinguishing appliances must be brought out and put in readiness. The stand pipes must be laid down to the hydrants, and the hose nozzled and coupled up to the stand pipes and/or to the plugs or pumps as the case may be. A sufficient number of men qualified to make efficient use of the appliances and under the control of a foreman, must be kept at their several posts so that—should occasion arise—the best possible service may be rendered.

## SECTION 17.

### HYDRANT SERVICES.

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A hydrant service in conjunction with a sprinkler installation represents almost the maximum of efficiency, as we know it to-day, in fire fighting. Especially where the potential volume of fire—as in the case of textile or other large manufacturing risks—is considerable, hydrants are essential to the extinguishment of a fire of serious proportions.

The standards laid down in this manual represent the accumulated experience of many years but however perfect the apparatus, its efficiency in fire fighting depends upon the rapidity with which it is brought into action and the ability with which its effort is directed.

As in the case of a sprinkler installation, it is more economical in the long run to instal apparatus of proved reliability, erected by contractors who have experience in the work. Maintenance is equally vital and the importance of organised

wet drill at frequent intervals, which ensures that each man carries out his allotted duties in the shortest possible space of time, cannot be too strongly emphasised.

The advantage of providing for possible future extension in any scheme of hydrant protection is often overlooked. A comparatively small extension with its attendant friction losses may overload a main so seriously as to necessitate replacement by one of larger size and the small additional initial cost of mains of somewhat larger capacity than immediate requirements may call for, often leads to ultimate economy.

The lay-out of a hydrant service depends upon a number of factors which cannot be defined with absolute precision in the manual and, for this reason any new or extension schemes should always be submitted to the Association for approval before being undertaken or even estimated. The Associations' inspection staff are always available for advice in connection with fire appliances and any request received through the Insurance Company interested will be given immediate attention.

## SECTION 18.

## REGULATIONS FOR HYDRANT INSTALLATIONS.

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NOTE :—Special rules apply to the Bombay Mofussil Gin and Press Factories, details of which are obtainable from the Leading Insurer covering the risk.

### WATER SUPPLY.

1. A water supply of at least 100,000 gallons of water must always be available to the pump suction at all seasons of the year solely for the hydrant service (or, in the case of large risk equipped with sprinklers, a supply of not less than 350,000 gallons for both hydrants and sprinklers) including any inflow water which would be available throughout a period of 4 hours. In cases where water can be concentrated in a town's main for augmenting the supply in a private reservoir, special consideration will be given to the size of the reservoir required.

### SUCTION PIPING.

2. The diameter of the suction pipe must be such that the rate of flow of water through the suction pipe will not exceed 300 feet per minute when the pump is delivering the maximum quantity of water required by the Rules. If, however, the pump is situated below the level of its water supply, the diameter of

the suction pipe may be based upon a rate of flow of 400 feet per minute.

It is essential that each fire service pump be provided with an independent suction pipe.

## SECTION 19.

### HYDRANT PUMPS.

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1. Pumps must be either—

- (a) Steam driven of an approved type either triple or quadruple acting ;
- (b) Centrifugal type driven by electric motor or steam turbine ;
- (c) Centrifugal type driven by petrol, motor spirit or compression—ignition engines (approved types only, see Appendices VII and VIII).

2. The capacity of the pump shall be determined by the size of the installation according to the following scale, and its delivery pressure must be not less than 100 or 120 lbs./sq. in., depending upon the risk to be protected.

In special cases the delivery pressure at 75 lbs./square inch may be permitted.

No. of Hydrants.	Capacity of Pump.
(a) Less than 15.	500 gallons per minute.
(b) 15 or over and less than 40.	625 -do-
(c) 40 or over	1,000 -do-

For the purposes of the above scale, double-headed stand pipes count as two hydrants.

3. The capacity of steam pumps must be based on the economical speed recommended by the makers and they must be provided with steam and water pressure gauges and safety relief valves. The working parts of the water end should be of non-corrosive metal. Sprinkler rules in regard to pumps should be adhered to where applicable.

4. The size of the initial pipe of the service mains must in no case be less than the internal diameter of the delivery outlet of the pump.

5. In all cases where steam-driven pumps are fitted the following conditions are applicable :

- (a) A boiler feed pump must be fitted in addition to the fire pump.
- (b) Steam for working the pumps must be maintained throughout the year, at not less than the minimum pressure specified by the makers, in at least one boiler.
- (c) The ratio of the area of steam cylinders to water cylinders must be not less than  $2\frac{1}{2}$  to 1 in any pumps fitted.

6. Risks having one boiler only cannot qualify for the allowance for hydrant installations.

7. The hydrant pump must not be used for boiler feeding purposes, but a connection for filling elevated hydrant or sprinkler tanks is allowed. This connection must be taken direct from the discharge of the pump through a stop valve on the pump to the top of the tank and not through the hydrant mains (see diagram on Page 30).

8. In all cases where electrically operated pumps are fitted, it is necessary to have an adequate and reliable electric supply always available, full details of which must be submitted for prior approval by the Association. The arrangements of the electric supply to the pump must conform generally with the rules laid down for sprinkler pumps.

9. In the cases of centrifugal pumps operated by internal combustion engines on ample supply of fuel must always be available (see para 13 of Appendix VII and para 14 of Appendix VIII).

## SECTION 20.

### ELEVATED TANKS.

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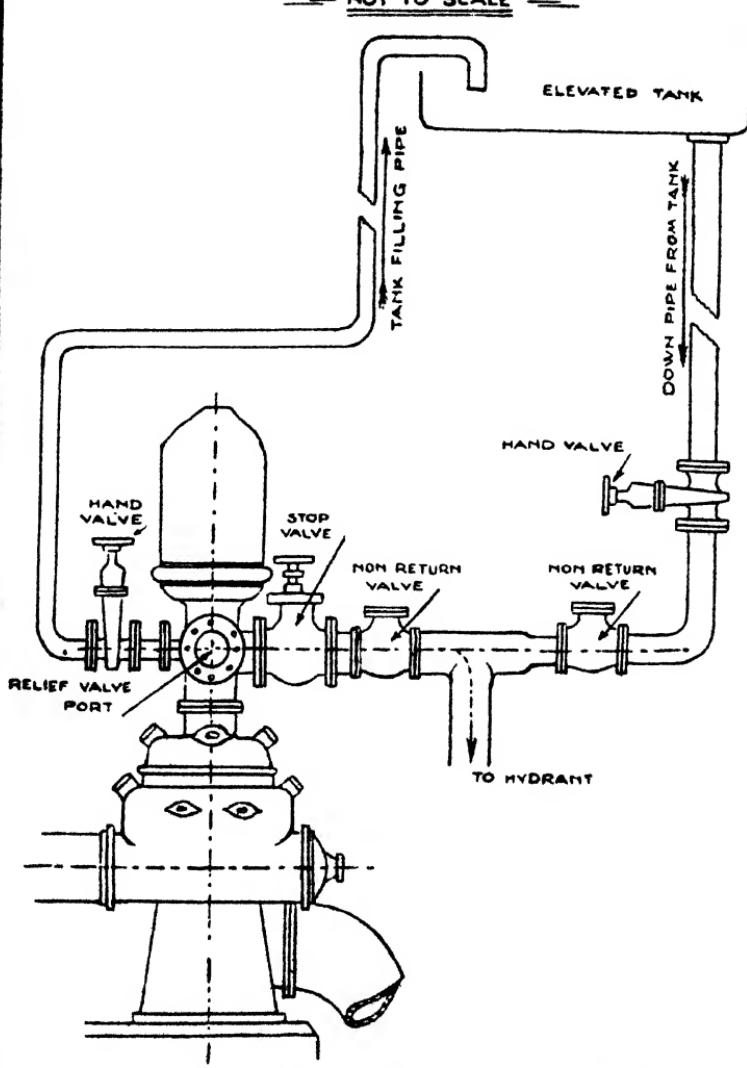
In risks situated in the territory under the control of the Bombay Association, Elevated tanks complying with the following regulations will receive favourable consideration for further discounts :—

Capacity 30,000 gallons. Height 20 ft. above the highest roof of any insured building.

The tank to be connected to the hydrant mains by not less than a 4" internal diameter pipe, and fitted with a sluice valve and a non-return valve. The non-return valve to be fitted below the sluice valve (an illustration on Page 29.)

DIAGRAMMATIC DRAWING SHOWING  
METHOD OF COUPLING PUMP & ELEVATED TANK  
TO HYDRANT SERVICE.

— NOT TO SCALE —



**SECTION 21.****MAIN PIPES.**

1. All main pipes must be to B. S. Specification and hydraulically tested to a pressure of not less than 174 lbs. per square inch.

2. The size of mains for the requisite number of hydrants shall be in accordance with the following table:—

Size of Pipe	NUMBER OF HYDRANTS ALLOWED.	
	On a terminal main	On a ring main
3" (not permitted in a ring main).	1	Nil
4"	3	5
5"	7	13
6"	13	Over 13

Provided always that

- (a) 25 per cent of the total length of the mains must be not less than 6" in diameter and 50 per cent of the balance of the mains must not be more than 1" smaller.
- (b) No greater number of hydrants than 13 is permitted on a terminal main.

3. In very large installations a certain proportion of the mains having a larger diameter than 6" may be necessary and proposals should first be submitted to the Association for confirmation.

4. Main pipes must be of the flanged type, but the spigot and socket type and, if underground, the pressure asbestos cement type, may be installed with the prior approval of the Association.

5. Cut-off valves are necessary to obtain the best possible pressure at the seat of a fire and, where a ring main is installed,

they also enable a damaged portion of the installation to be isolated whilst full pressure is available throughout the remainder. These valves are distributed according to the general layout of the installation and not according to fixed rules. For this reason the proposed position of these valves must have the prior approval of the Association.

6. All cut-off valves must be of the right-hand type and enclosed in a properly constructed surface box, at least 4'-0" square, so as to allow of broken joints being easily remade. Valve wheels should have an arrow head engraved or cast thereon shewing direction for turning "off" and "on" or "open" and "close." (It is advisable to engrave the vernacular equivalents also).

7. The position of the surface box must be indicated on the nearest wall by an iron plate painted scarlet, with distinct lettering both in English and the vernacular. Such plates should also show the "open" or "close" direction as cast on the valves.

## SECTION 22.

### HYDRANTS.

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1. Adequate water pressure must be immediately available at all hydrants both by night and day.

2. Except where impracticable and special sanction is given, all hydrant valves must be situated 3'-0" above ground, easily accessible and so distributed as to protect the buildings on all sides.

3. Only oblique Hydrants of an approved type may be used and in the ratio of not less than 1 to every 150 feet of external wall measurement. When fitted below ground level, one stand pipe must be provided for every two hydrants.

4. Measurement will be calculated on the total length of all walls of all buildings to be protected, except in the case of opposing buildings within 75 feet of each other, where the measurement of the shorter opposing wall may be omitted from the calculation.

5. Double headed hydrants must consist of two separate landing valves. Double outlet hydrants with a single control valve will not be approved.

6. Hydrants should be so placed as to give the most effective service and not necessarily equidistant from each other. Advantage should be taken of convenient door and/or windows to place hydrants so that long lengths of hose are not necessary to reach openings through which the fire may be attacked. The relative fire hazards of different portions of the risk should also be considered.

7. No building will be deemed to be protected by a hydrant unless such hydrant is within 50 feet of the building. In the case of Godowns, it is necessary to have two single or one double headed hydrant within 50 feet of the building, the layout being such that two jets of water can be played simultaneously on to the highest point of the roof.

8. In new mills or in the case of extensions it is recommended that where practicable, the trunk mains be carried on supports in culverts and as far as possible laid on the same plane and all sharp bends avoided.

9. **Hydrant Heads** where possible should be positioned at distances of not less than six feet from the face of the building or edge of the storage plot to be protected.

10. (a) Couplings must be of the instantaneous spring-lock type (*vide* Hose regulations in Section 23 para 5).

(b) Hydrant valves must be of the screw-down type.

(c) Plug-cocks will not be accepted.

11. (a) Hydrants situated above ground so that they are exposed to vehicular traffic must be suitably protected on all sides against possible damage.

(b) Where permission has been given for hydrants to be installed below ground, they must be properly enclosed in a surface box of cast iron or masonry 2'-0" square which must be at least 3" above ground level and the top of the outlet should be not more than 3" below the top of the box.

12. In cases where walls abut on roads or other property and it is not possible to place hydrants to cover such portion of the building, a special application must be made to the Association who will deal with each case on its merits. Generally speaking the principles governing the decisions of the Association in such cases will be—

(a) mains carried inside the building and hydrants placed below ground, or—

(b) extra lengths of hose to allow the seat of a fire to be reached from the other side of building.

- (c) Applicants are advised to refer to the Association, in cases of this kind, before commencing work.

13. In the case of all storied buildings there shall be not less than two external iron or masonry staircases giving satisfactory access to each compartment on every floor. A hydrant shall be provided on every landing, each having two lengths of hose and nozzle always ready. The mains feeding hydrants on the landings shall have a cut-off valve at ground level.

- (a) Staircases must, unless impracticable be of the straight type, not less than  $2\frac{1}{2}$ ' wide with 6" treads and rises not more than 8". Landings should be not less than 5' x 4'.
- (b) Iron rung ladders cannot be accepted in lieu of staircases, but straight ranges of an approved type may, at the discretion of the Association be accepted in special cases.
- (c) An internal fireproof staircase with protected openings may, at the discretion of the Association be accepted in lieu of **one** of the external staircases.

14. When materials are stored in the open, the storage site shall be deemed adequately protected if there be installed one hydrant to every 75 feet of external measurement of the site (with a minimum of four hydrants), so spaced as to be capable of throwing 4 jets simultaneously on any part of the site.

## SECTION 23.

### FIRE HOSE AND ITS MAINTENANCE.

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1. To every hydrant (a double-headed hydrant counting as two) there shall be not less than 100 feet of  $2\frac{1}{2}$ " or  $2\frac{3}{4}$ " hose pipe in 50 feet lengths complete with couplings, also one branch pipe and nozzle.
2. For use with each hydrant on fire escape landings two lengths of hose 25 ft. in length shall be provided as 50 feet lengths are considered too unwieldy.
3. Spare hose to the extent of 10 per cent of the above requirements, with a minimum quantity of 100' and a maximum quantity of 500' must always be kept readily available. Such spare hose must also be in 50' lengths ready attached to couplings.

NOTE:—In calculating the number of branch pipes, nozzles or lengths of hose required under the above scale, any fraction of a number must be counted as one.

4. All hose must be Flax Canvas Fire Hose—Unlined—and be certified by the makers to withstand a pressure of not less than 300 lbs. per square inch.

5. All couplings are to be of the "instantaneous" spring-lock type and nozzle of not less than  $\frac{3}{4}$ " diameter. Screw type couplings will not be accepted.

NOTE:— Specimen couplings can be seen at the office of the Association and illustrations are given on pages herein.

6. The following method of attaching hose to couplings, other than the ferrule type, is given for general information:—

Each half of the coupling should have two  $\frac{3}{16}$ " diameter holes drilled in the tail. The hose is first fixed to the tail of the coupling with copper rivets, then "served" or "bound" with 16 gauge copper wire for a length of 2 inches which will extend to the outer ends of the grooving on the coupling tail: over the copper wire, a leather protective band is bound with four strands of 18 gauge copper wire at each end of the band. The leather band should be carried beyond the tail of the coupling to prevent kinking. The copper wire must be softened before being used.

Couplings attached by bands will not be accepted as they are apt to become dislodged under pressure.

7. Hose may be kept either—

- (a) In wall boxes, constructed either of wood or cast iron or sheet iron and preferably painted a bright scarlet, or
- (b) In fire stations conveniently distributed at various points throughout the installation.

8. Where hose boxes are used these should contain the requisite length of hose for the hydrant served, also a tin containing a set of spare rubber rings packed in French chalk for purposes of preservation.

9. The difficulties attendant upon opening a number of boxes in an emergency and the proper maintenance of hose, rings, etc., in good condition have led the Association to suggest the establishment of "fire stations", especially in large risks. An illustration of the type suggested is given on Page 29. It will be seen that the condition and quantity of hose, nozzles,

etc., can be checked over at a glance and other useful equipment in the event of a fire is ready to hand.

10. Hose boxes should be so arranged that no rays of the sun will affect the hose.

11. A system of marking and numbering hose should be arranged so that the various lengths are easily recognisable.

12. A hose Register should be kept shewing the history of each length. Information such as date purchased, date brought into use, date cut (if reduced in length) is useful and a column should be provided for remarks by the Associations' Inspectors to whose inspection the Hose Register should be open.

13. Any hose becoming inefficient through use, neglect, or from any other cause, must be discarded.

14. Fire protection hose must not be used for other than fire protection and drill purposes. Managers are advised to keep a supply of cheap hose for watering paths, washing out or filling boilers, etc. Such hose should not be mixed with fire protection hose but kept in an entirely separate place.

15. Considerable diversity of practice has been noticed in the attention paid to the drying and storing of hose and the following suggestion in this connection should be carried out.

After use, hose should be thoroughly washed in clean water and should then be thoroughly dried. A rack or some similar contrivance should be provided on one of the higher buildings so that, after cleaning, hose may be suspended at its full length to drain and dry evenly. This should be done in the shade and not in the sunshine so that the hose is evenly dried inside and out. Care should be exercised that it is not removed until it is thoroughly dry in all places. The hose should then be thoroughly brushed with a hard bristle or wire brush, after which it should be re-rolled; care being taken to choose a dry and clean place whereon to roll it; and replaced in the boxes or hose stations.

Care should be taken after washing that the hose does not touch the ground, where it might be soiled.

Hose should be rolled up evenly and carefully, the "female" or spring coupling end being in the centre. In this manner the spring clips, when grasped one in each hand, form a "reel" and the hose can be quickly run out in the event of fire.

**OR ALTERNATIVELY.**

The hose may be doubled in the centre of its length and rolled up evenly from the fold. Both the Male and Female couplings will then be on the outside to the roll. This permits of the nozzle being attached to the hose while being stored in readiness for use, and the hose run out without twisting.

**BRANCH PIPES AND NOZZLES.**

16. (a) Branch pipes may be either of copper or aluminium with a gun-metal ring at the discharge end, screwed to receive the nozzle, and provided at the other end with a gun-metal ring to fit into the "instantaneous" coupling.
- (b) Nozzles may be of gun-metal or aluminium.

Illustration of hose-coupling showing the wire-bound method of attachment mentioned in Section 23 Para 6.

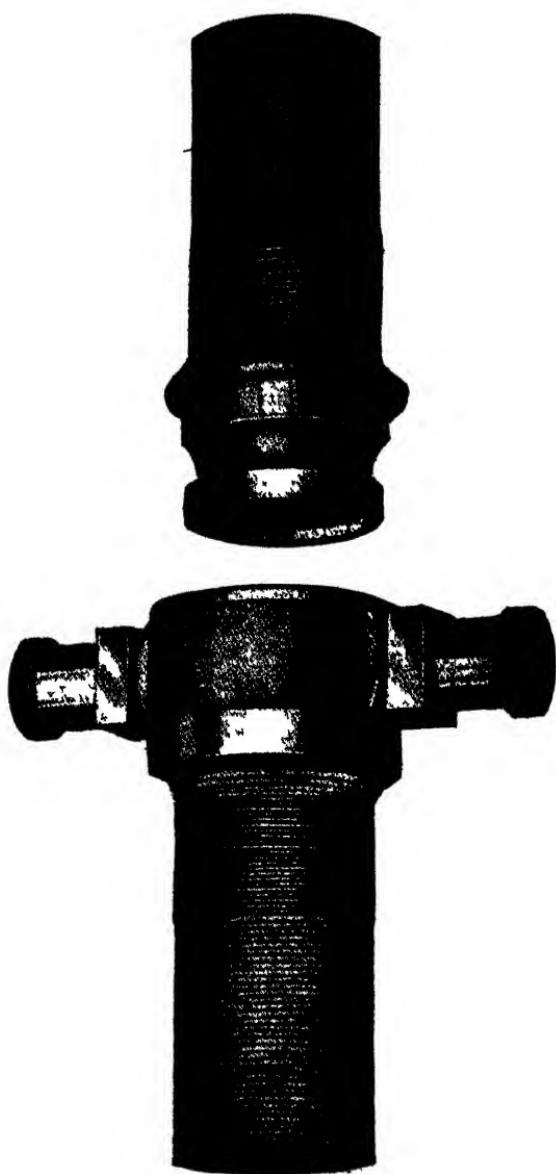
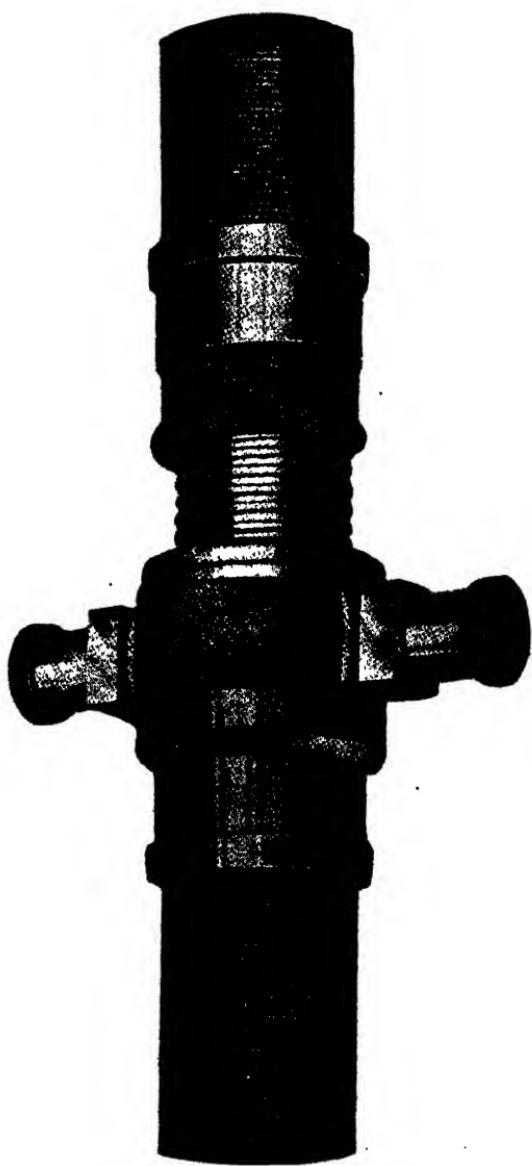


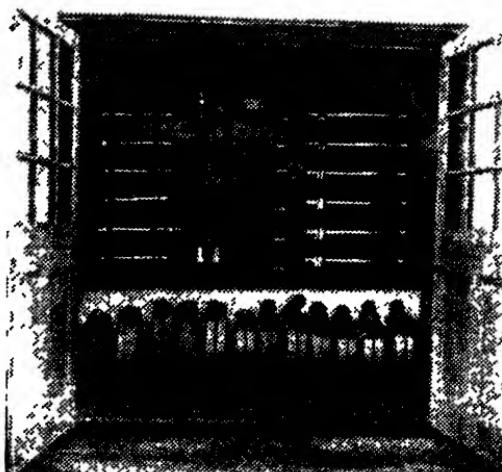
Illustration of hose-coupling showing the ferrule type of attachment mentioned in Section 23 Para 6.



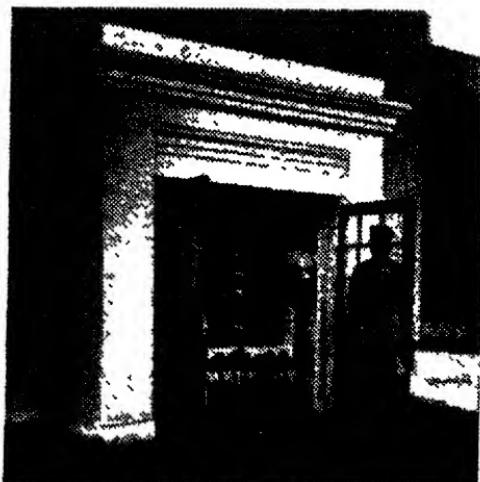
### **FIRE STATIONS.**

The illustration below are examples of the most serviceable type of fire station referred to in Section 23 Paras 7(b) and 9.

### **FRONT VIEW.**



### **SIDE VIEW.**



The distribution of fire stations depends upon the layout of the risk and should only be determined after reference to the *Assessment*.

**SECTION 24.****MAINTENANCE OF HYDRANT SERVICE EQUIPMENT.**

1. Hydrant mains should be tested once a month with the pump delivering at its maximum pressure, with all hydrant valves closed and, thereafter, a running test with two or more hose jets operating, should be carried out.

This checks the efficiency of the pump as well as the tightness of the Hydrant mains.

2. All Hydrants must be tested systematically to ensure that valves and spring catches are maintained in good condition.

3. Spare leathers must be kept for Hydrant valves.

4. **Pump.** All pump glands both steam and water must be maintained in efficient working condition and the packing renewed as required to maintain efficiency.

5. Pumps and all working parts must be kept clean and lightly oiled as cleanliness greatly adds to efficiency. Any necessary repairs must be put in hand and carried out immediately.

6. In the case of steam driven reciprocating pumps, small parts such as snifting valves, cushioning valves and pet cocks, must have special attention because faults in these valves cause the pump to knock badly and lose efficiency.

7. Suction and delivery valves should be examined at regular intervals particularly where sand or other objectionable matter is liable to be drawn through the pump suction.

8. In the case of steam pumps the relief valve must be set at 120 lbs. per square inch pressure, and if of the weight and lever type, the weight, when set, must be secured and locked in that position.

9. A trained Pump man must be available on all shifts and at all hours of the day and night to operate the pump as and when required.

10. **Spare Gear.** For steam Reciprocating pumps a minimum of two set of piston and bucket rings must be provided.

11. **Quarterly Inspection Reports.** In the case of risks situated in the Mofussil, the Insured must submit to the Association, through the Leading Office on the risk, completed Quarterly Inspection Reports (see Appendix V—copies of

which are obtainable from the Association) on or before the last day of January, April, July and October of each year.

## SECTION 25.

### HAND APPLIANCES.

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1. These appliances are not intended to deal with large outbreaks of fire but are for attacking small fires in their incipient stages. Moreover, in supplementing the action of sprinklers by dealing with concealed spaces, they must be regarded as an essential part of the fire fighting equipment.

2. Careful supervision is necessary to ensure that buckets are kept full and in their proper places also that extinguishers are in working order. No less important a factor is the proper distribution of these appliances throughout the risk so as to be convenient for the operators and available in places where they are most likely to be required and thus of the greatest use.

3. If fixed on regular brackets they are readily seen and should any be missing, the discrepancy is easily detected. In the case of buckets of water it is permissible, however, to keep them nested in a tank or barrel full of water. Tanks with nests of buckets should be placed as centrally as possible. In the case of textile mills it is strongly advised that a bucket be slung at the end of each frame in the Spinning and Roving Departments.

4. It is recommended that the number of buckets and extinguishers required in each department should be clearly painted over or near the main entrance to each department.

5. As certain types of extinguisher are pre-eminently suitable to particular types of risk, care should be taken in selecting a type that will deal with the individual hazard of each risk. Everything depends, however, on the speed with which they are brought into use as they are essentially "first-aid" equipment only.

## SECTION 26.

### REQUIREMENTS OF HAND APPLIANCES ARE AS FOLLOWS.

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1. **Buckets** :—A supply of not less than 1 to each 1,000 superficial square feet or part thereof in each compartment always full of water or sand depending

on the type of risk to be protected. Buckets to be of an approved type and to hold not less than two gallons of water.

AND

**Extinguishers** :—A supply of not less than one two-gallon extinguisher of an approved type to each six buckets or part thereof in each compartment, with a minimum of 12 spare charges always in stock and readily available.

2. Extinguishers must be marked with the year of manufacture, the capacity and maker's name and bear a declaration that they have been tested to 350 lbs. per square inch. They must also be of a type approved of by the Fire Offices' Committee (Foreign).

#### BUCKETS.

3. Buckets must be of substantial make, preferably of the pointed or round bottom type and must be painted scarlet. Tins or the like will not be accepted in lieu of buckets.

4. Fire buckets may not be used for any purpose other than that for which they are intended.

5. To prevent breeding of Mosquitoes and comply with the Municipal rules the water in fire buckets should be treated with sapon creosote or phenyle in suitable quantities to just discolour the water.

6. In all risks the proprietors must arrange to provide at least one man whose duty is to see that the fire buckets are filled with water and the extinguishers are in an efficient working order and that both are in their correct positions.

It is recommended that this man be attached to the Engineering Department.

#### SECTION 27.

#### EXTINGUISHERS.

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1. Only extinguishers of a type approved of by the Fire Offices' Committee (Foreign), will be accepted.

2. Under special circumstances, extinguishers of a larger type or an approved chemical engine may be substituted for some of the extinguishers required in accordance with the above standard, with the prior approval of the Association.

3. In special cases, approved by the Association, extinguishers may be dispensed with, provided the supply of buckets as defined above is doubled. This arrangement is not, however, encouraged.

4. **Electrical Plant** :—For rooms containing electrical equipment, the extinguishers must be of the specially approved liquid (Carbon Tetra Chloride) type, or dry powder type or Co. liquid (Carbon Tetra Chloride) type, or dry powder type or C.O., type.

5. In the case of motors mounted on platforms, it is recommended that an extinguisher be installed on each platform. Any buckets installed must be filled with dry sand instead of water.

6. **Oil and Spirit Risks** :—In all premises where oil or spirit giving off an inflammable vapour under 73°F, is stored or used, the buckets must be filled with dry sand and the extinguishers must be of an approved "Foam" type.

## SECTION 28.

### MILL AND FACTORY FIRE BRIGADES.

1. As the efficiency of a hydrant service and/or of hand appliances depends upon the manner and speed with which they are handled, a brigade formed of men including night watchmen trained, in the operation of the fire service is essential. The number will necessarily depend upon the size of the risk but eight is the minimum number that must be provided for any risk.

2. A muster roll showing the duties allocated to each member of the brigade must be prepared and copies supplied to each supervising member of the brigade, as well as posted in convenient places throughout the premises, so as to be quickly available for reference in case of emergency.

3. Practice drills should where possible, take place, weekly and it is a condition of the approval by the Association to the discount for hydrant services that wet drill shall be carried out at intervals of not less than one month.

4. A muster register must be kept showing details of all practices and any defects reported in the installation. This register must be open to examination by the Associations' Inspectors.

**SECTION 29.****INSPECTION STAFF. (See Preface).**

The Insurance Associations undertake as far as possible, the periodical inspection of all premises in which fire extinguishing appliances, entitling the proprietors to special discounts or ratings for such appliances, are installed.

The primary duty of the Associations Inspectors is to report to the Association on the condition and efficiency of the appliances installed as well as ensure that the regulations are being observed. They will, however, give help and advice in the maintenance of the appliances and on matters pertaining to fire protection and prevention.

The attention of the Inspectors must be drawn, during their visits, to any changes effected since the previous inspection or to any contemplated extensions and alterations to the existing services. This procedure does not, however, dispense with the necessity of advising the Insurance Company or Companies interested on the risk of any changes which affect the plan of the risk or the details of the appliances filed with the Association.

**SECTION 30.****REQUIREMENTS REGARDING PLANS.**

Plans for submission to the Association must be drawn up in accordance with the following requirements, and must be dated.

**New Installations** :—Plans of New Installations must show the entire compound, all buildings therein and the boundary walls. Buildings under construction and possible future extensions should be indicated by dotted lines.

**Extensions** :—Plans of extensions to approved existing Installations need not show the rest of compound but sufficient details should be given to indicate clearly where the extension is to take place.

**Material** :—Plans must be on white paper or tracing cloth (Blue Prints, except where supplied by Sprinkler contractors, will not be accepted). Ferro-Gallic prints (black lines on white paper) will be accepted.

**Size** :—The paper upon which plans are drawn or printed must not exceed 28" x 48" and the minimum size shall not be less than 20" x 24". A clear margin of at least 3" shall be left on the left-hand side (the narrow side) of the plan. If possible plans should be drawn to a scale of 20', 40' or 60' to the inch. In the case of very large compounds with more than one Mill it is advisable to submit separate plans of each Mill, with a key plan (on small scale) showing the situation of the various Mills, etc., in the compound. Plans should not be folded or creased, but rolled.

**Signs to be used** :—Pucca Walls to be shown by a thick black line, doors and windows being clearly marked.

Iron or other Thin Walls to be shown by a thin black line.

**Perfect Party Walls** :—Party walls complying with the Association's requirements should be indicated by the sign— at each end of the wall, thus——“T”, or have the letters “P.P.W.” alongside or across them at regular intervals.

**Roofs** :—Sectional elevations of roofs in detail indicating materials used in construction should accompany ground plans.

Fireproof Doors to be marked as follows :—

S.I.D.	Single Iron Fireproof Door.
D.I.D.	Double Iron Fireproof Door.
S.F.D.	Single Armoured Fireproof Door.
D.F.D.	Double Armoured Fireproof Door.

Fireproof Shutters to be marked as follows :—

I.S.	Iron Fireproof Shutter.
A.S.	Armoured Fireproof Shutter.

**Water Tanks on Roof** to be shown hatched, and capacity to be stated.

**Skylights** to be shown, to scale and marked “Skylight” or “S.L.”

**Boilers** to be shown by a rectangular figure marked “Boiler” in the centre.

**Hydrants Mains** to be shown by a red line, the sizes of pipes being marked 6", 5", 4", etc., and the place where a reduction is made marked on the line by a cross.

**Hydrant Heads** to be shown by a red dot or circle not less than  $\frac{1}{2}$ " diameter; double hydrants being shown by double dots or circles; and indicated thus S.H. (Single Hydrant), D.H. (Double Hydrant).

**Cut Off Valves** to be shown by S.V. drawn across the mains thus.....V.....S.V.

**Suction Piping** to be shown in blue.

**Fire Pump** to be marked "Fire Pump", stating the capacity.

**Water Tanks and Reservoirs** to be shown to scale and the average depth marked on plan.

**Oil Tanks** to be drawn to scale in black and marked "Oil" or "OIL FUEL".

**Open Storage.** At all risks where certain raw materials are usually stored in the open during a season of the year, any place reserved for such storage must be clearly shown by hatched outlines and marked "Open Storage Site No.....".

**APPENDIX I**

.....  
.....  
.....19

The Secretary,

**INSURANCE ASSOCIATION.**

Dear Sir,

**Application for Fire Appliance Discount.**

(Risk)

(Situation)

Please sanction, as from date of receipt by you of this application, a Discount of .....% for the following Extinguishing Appliances:—  
applying to Buildings—

(The number or letter of each building must be clearly stated).

I/We enclose plan of the Risk.

I/We certify that to the best of my/our knowledge and belief the appliances referred to have been installed in strict accordance with the Rules of the Association and I/we also certify that the Plan submitted is drawn up in accordance with the Association Rules (as detailed on back hereof) and is correct and up to date.

I/We also certify that a copy of the plan exact in every detail, is available for the Association Inspector's use at the Mill (or premises above referred to).

I/We enclose full particulars of the Appliances available together with letter of Guarantee signed by the Assured.

I am (We are),  
Yours faithfully.

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**For use of the Association only.**

Date received

Date inspected

Inspector certifies in order (or otherwise)

Discount sanctioned

Date of Minutes

Reference Number

.....  
*Inspector.*

## APPENDIX II

.....19

The Secretary,

## INSURANCE ASSOCIATION.

Dear Sirs,

## Guarantee regarding Fire Extinguishing Appliances.

In consideration of your Association granting a Discount for the Fire Extinguishing Appliances detailed on attached/signed form which we have installed in the.....

.....situated at .....

I/We hereby engage ourselves—

(1) To maintain and upkeep the said appliance in efficient working order (and where such appliances and Association Rules require the upkeep of a trained Fire Brigade to, maintain such Brigade to its full numbers in an efficient state).

(2) To advise the Association and first obtain permission (through the leading insurance Office on the risk), should at any time it be necessary to close down steam or in any way throw the said appliances out of operation for repairs, overhaul, &c.

(3) Not to extend, alter or demolish existing Buildings or to erect new Buildings in the Compound of the premises without supplying the Association (through the leading Office on the risk) with a revised plan or revising the plan filed with the Association.

(4) To keep at the above described premises a copy, exact in every detail, of the plan supplied to your Association, same to be available to the Association's Inspector during his visits of inspection.

(5) Not to re-number (or re-letter Buildings, Compartments, &c., as recorded on the plan filed with the Association without advising the Association (through the leading Office on the risk) of such revision.

I am (We are),  
Yours faithfully

**Note :** All communications to the Association must be through the leading Office on the risk.

This space for the use of the Association only.

Date from which sanctioned

Minutes of

Reference Number

Remarks

## APPENDIX III

## DETAILS OF FIRE APPLIANCES AVAILABLE AT THE

<b>WATER SUPPLY.</b>	
(1) From what source is the water obtainable for the Fire Service ?	
(2) If from tanks, give the quantity always available in each, also state how replenished.	
(3) Can they be replenished at all times of the year, and if from a river, at all states of the tide ?	
<b>PUMP.</b>	
(1) Is there a special Pump for the Hydrant Service ? Where is it located ?	
(2) Is the Pump used for any other purposes ? If so, mention them.	
(3) Maker's name. Age of Pump.	Name.....Age.....
(4) Type of Pump, i.e.. Flywheel or Direct Acting.	
(5) Number of Rams, Single or Double Acting ?	Rams.....Acting.....
(6) Diameter of Steam Cylinders. Water Cylinders, Length of stroke.	Steam.....Water..... Stroke.....
(7) Maker's guaranteed capacity.	
(8) Maximum Steam Pressure at which the Pump will work. Minimum Steam Pressure available when main engine is stopped.	Maximum .....Minimum.....
(9) Diameter of Suction, Diameter of Delivery.	Suction.....Delivery.....
(10) Length of Suction, Maximum depth water has to be raised.	Length .....Depth.....
(11) Is the Suction Pipe fitted with a Foot Valve ? Strainer ?	Foot Valve .....Strainer.....

<p>(12) Is the Pump fitted with an Air Chamber? Safety Escape Valve? State type of Safety Valve. And to what pressure it is loaded?</p> <p>(13) Is there a Pressure Gauge close to the Pump?</p> <p>(14) Can the Pump supply at one time four effective Fire Streams through <math>\frac{3}{4}</math>" Nozzles on to the roof of the highest Building?</p>	<p>Air Chamber.....Safety Valve.... Type ..... .... Pressure.....</p>
<p><b>ELEVATED TANKS.</b></p> <p>(1) State height of base from ground level. Also give height of highest building from ground level.</p> <p>(2) State capacity in gallons, and how replenished.</p>	<p>Height of Base... ... .....</p> <p>Height of Building. .... .....</p>
<p><b>HYDRANT MAINS.</b></p> <p>(1) Internal diameter of Mains. " " branches to Hydrants.</p> <p>(2) To what pressure have the pipes been tested?</p> <p>(3) State material pipes are made of. And describe method of jointing.</p> <p>(4) Are there cut-off valves? Are these valves worked and oiled regularly?</p>	
<p><b>HYDRANTS.</b></p> <p>Number of .....</p> <p>(1) State whether single or double outlets. If both, distinguish on Plan. State whether above or below ground.</p> <p>(2) If below ground, are they properly enclosed in Surface Boxes? Are the Boxes surrounded by Brick Work?</p> <p>(3) Are the tops of the boxes raised above ground level? Has each Hydrant an Indicator mark on the wall opposite?</p>	

(4) Are there stand pipes ? (5) If so, have they single or double outlets ? Are outlets Instantaneous or Screw ? (3) Are all the couplings interchangeable ?	
<b>HOSE.</b> (1) What Material ? And Diameter ? (2) What pressure is the Hose tested to stand ? (3) Total length available. How many lengths ? How much spare kept in stock ? (4) Is all the Hose Pipe capable of sustaining full Pressure ? (5) Where is the Hose kept ? (6) Are there boxes near each Hydrant in which a supply of Hose and Nozzle is kept ready for immediate use ? State supply in each box and length of each Hose. (7) How many Branch Pipes and Nozzles are there ? Diameter of Nozzles ? (8) What means are used for drying the Hose after use ?	Material.....Diameter.....  Total length.....No. of lengths .. Spare.....  Number.....Diameter.....  
<b>BUCKETS.</b> (1) How many Buckets are there, and what is the proportion to each 5,000 superficial feet ? (2) Where in the Departments are they placed ? (3) Size of Buckets. (4) Whose duty is it to see that the Buckets are kept full of water ?	
<b>CHEMICAL EXTINGUISHERS.</b> (1) Are there any of these ? If so, how many to each 5,000 superficial ft.? (2) State capacity in gallons. State number of spare charges kept in stock. (3) Maker's. name. Pressure tested to and date of manufacture.	

## DETAILS OF BUCKETS AND EXTINGUISHERS.

Department.	Area in sq. feet.	No. of Buckets.	No. of Extinguishers.

## SPRINKLERS.

- (1) Is the Risk protected by an Installation ? State name of Sprinkler.
- (2) Is the Pump connected to the Hydrant Service ? If so, where is the connection ?
- (3) Is the Pump Automatic ? And if so, is it kept always working ?

## FIRE ESCAPES.

- (1) Is the Risk (if a storied one) fitted with outside staircase ? How many ? Iron or Masonry ?
- (2) Are Hydrants attached on each landing with Hose Branch Pipe and Nozzle in a box ready for use ?
- (3) If enclosed masonry staircases, do the walls extend to the roof ?

<b>NIGHT WATCHMEN.</b>	
(1) Are means employed to ensure night watchmen going round the risk at intervals ?	
<b>FIRE BRIGADE.</b>	
(1) Is there a staff of men drilled in the use of the Extinguishing Appliances ? State number of men.	
(2) State the number of Assistants residing on the premises.	
(3) How many are told off for Fire duty each week ?	
(4) Is there a muster book kept for Fire Drills ?	
(5) How is the Fire Alarm given to the Brigade ?	
<b>TESTING APPLIANCES.</b>	
(1) Are the Pumps, Hydrants and Hose tested regularly ? How often ?	
(2) Whose duty is it to attend to this ?	
(3) If defects are found, is there a record kept of same ?	
<b>TELEPHONE.</b>	
(1) Is there telephonic communication between the Risk and Head Office or Exchange ?	

Signature.....

(Form to be signed by the Owner of the Premises.)

## APPENDIX IV

### REPORT ON AUTOMATIC SPRINKLER INSTALLATION.

Issued—April, 1909. (Foreign.)

Name of Firm.....  
 Name and Situation }  
 of Risk (in full) }  
 Purpose for which premises are used.....

Name and particular pattern of Sprinkler.....  
 How many separate Installations.....  
 Size of each set of Main Installation Valves.....  
 By whom installed.....  
 Date completed.....

No. on Plan.	No. of stories in each.	Description of ceiling or roof	Area in square feet.	SPRINKLERS per storey provided.						General Remarks as to protection, apparent over protection.	
				1st	2nd	3rd	4th	5th	6th	7th	
		NOTE—When these differ for various stories describe in a separate line.	Celler								Is Spacing in accordance with Rules?

**The Sprinklered Building.**

- (1) Stories separated from the sprinklered portion by a Fire-proof Floor without opening of any kind.
- (2) Fire-proof Rooms used for general purposes and separated from the sprinklered portions by a brick or stone wall every opening in which is protected by a fire-proof door.
- (3) Fire-proof Rooms used only for storage purposes and separated from the sprinklered portion of the Building by a brick or stone wall with or without openings.
- (4) Staircases and W. C.'s constructed of brick, stone, concrete and/or (iron enclosed by walls of brick work, masonry, and/or) cement concrete all the openings therefrom into the sprinklered portion being protected by doors.

If any portion of the building not complying with the description given in Clauses (1), (2), (3) or (4) is unsprinklered, please give particulars :—

.....  
.....  
.....

If there is any unsprinklered room as in (3), is every doorway, window and other opening protected by a sprinkler placed in the unsprinklered room in close proximity to the opening ?....

If there is any staircase constructed as in (4) with a non-fire-proof ceiling over the top landing is such ceiling sprinklered ?....

.....  
If there is a store-room above such ceiling, is the store-room sprinklered ?

.....

**Buildings Adjoining and/or Communicating with Sprinklered Building.**

(b) If the Sprinklered Building communicates with—

- (1) An unsprinklered Fire-proof Building ; (2) an unsprinklered Fire-proof storey of another Building ; or (3) an unsprinklered Fire-proof Room or Compartment in another Building, is every opening protected by a Fire-proof Door ?.....  
.....OR, if such unsprinklered Fire-proof Building, Storey, Room or Compartment is used for storage purposes only, is there a brick or stone wall separating it from the sprinklered Building ?.....

If so, is each opening in said wall protected by a Fire-proof Door ?...  
Or, is every opening protected by a Sprinkler ?.....

(c) If the Sprinklered Building adjoins and/or communicates with an unsprinklered non-fire-proof Building—

- (1) Is such non-fireproof Building a Shed ?.....  
If a shed, state below the construction and other particulars.  
Walls..... Are there any wood linings ?.....  
Roof..... Floor.....  
Are there any galleries or lofts ?.....  
For what purposes is the Shed used ?.....  
Is every opening into the Sprinklered Building protected by Double Fire-proof Doors ?.....

Is every opening into the Sprinklered Building protected by Single Fire-proof Doors?.....  
and by a Sprinkler in the Shed in close proximity to the opening?.....

(2) Is the unsprinklered Building of more than one storey?.....  
If so, does the dividing wall go through the roof?.....  
Are all openings between the two Buildings protected by Double Fire-proof Doors?.....

(d) Is there a clear space maintained between Sprinklers and Goods as required by Rule 6 of Section 15.....

(e) Are all the spaces between the ceilings and roofs either at the appex or sides sprinklered.....

(f) Are all hoists, elevators shoots, rope and strap races, non-fire-proof W.C.'s gearing boxes, non-fire-proof staircases, and openings in floors for ropes, etc., protected as required by Rule 1 of Section 6.....

(g) Are all exhaust trunks sprinklered in accordance with Rule 3 of Section 6.....

(h) CORN MILLS. Are elevators, dust trunks, and spouts and spaces between Centrifugals sprinklered in accordance with the Rules?.....

#### Water Supplies.

(a) How many and what separate supplies are there?.....

(b) Is each always available?.....(c) Which is practically unlimited?.....

(d) Is the water free from salt and matter in suspension likely to cause accumulation in the pipes?.....

(a) Diameter of—(1) Street Main... .....inches. (2) Branch Pipe from Street Main.....inches.

(b) Is the Branch pipe used for Sprinkler Service only?.....

(c) If not, state diameter of pipes taken off, and for what purpose they are used?.....

(d) What is the minimum standing pressure at the level of the highest Sprinkler day or night?.....

(e) What is the pressure indicated by the gauge below the Main Stop Valve (1) Before opening the Waste Valve?.....  
(2) When the 2-in. Waste Valve is fully open?.....

(f) What is the pressure indicated by the gauge on the Town's branch outside the Back Pressure Valve.  
(1) Before opening the Waste Valve?.....  
(2) When the 2-in. Waste Valve is fully open?.....

**N.B.**—In making the test (e) 2 and (f) 2 the Valve must be kept fully open until the pressure gauge finger reaches its lowest point. If a gravity tank is a supply to the installation and water is drawn therefrom during the test, a further test must be made with the tank supply inoperative, and the result recorded.

(g) What is the pressure at the level of the highest Sprinkler when the 2-in. Waste Valve is fully open?

(h) When the water supplies consist of two Towns' Mains, are they carried separately close up to the wall of the Sprinklered Building?.....

(i) Are the Mains from the respective reservoirs interconnected in any way before the branches are taken off to supply the Installation ?... If so, the case must be specially submitted with full particulars and sketch plan of the Mains

**N.B.**—When the supplies consist of two separate Towns' Mains, particulars as required by (a) to (g) must be given for both mains, and a separate test of each main recorded.

(j) If the water is supplied by Meter state the make of Meter and size...

**Elevated Tank.**

(a) Position.....(b) Height of base above the highest Sprinkler.....feet.  
 (c) Dimensions.....(d) Capacity.....gallons  
 (e) How supplied ? .....  
 (f) What quantity of water cannot be drawn off except for Sprinkler service ?.....gallons.  
 (g) Position of the indicator showing the depth in the Tank ?.....  
 (h) Is the Tank provided with a cover ?.....(i) How often is the Tank cleaned out ?.....  
 (j) What is the diameter of the pipe to Sprinkler Service ?.....inches.  
 (k) Is the tank used exclusively for Installations in Buildings in one ownership ?  
 .....

**Pressure Tank.**

(a) Position.....Is it inside a Sprinklered Building ?  
 .....  
 (b) Dimension.....(c) Capacity.....gallons. (d) Is it level with the highest Sprinkler ?.....  
 (e) If not, what is the distance between the level of the bottom of the Tank and that of the highest Sprinkler ?.....  
 (f) What proportion of the Tank is filled with (1) Water ?.....  
 (2) Air ? ..  
 (g) What is the minimum air pressure maintained in the Tank ?.....lbs.  
 (h) Is the Tank fitted (1) With an air pressure gauge ?.....  
 (2) With gauge glasses to show the level of the water ?.....  
 (3) If so, are the stop taps on such gauge glasses kept shut ?.....  
 .....  
 (i) From what source is the Tank supplied ?.....  
 (j) Is there both a Stop tap and a back pressure valve on (1) The pipe feeding the Tank with water ?.....  
 (2) The pipe through which air is pumped into the Tank ?.....  
 (k) Is there a Stop Valve on the delivery pipe to the Installation ?  
 (2) If so, how is it secured open ?  
 .....

**Pump.**

(a) Position ?  
 .....  
 (b) By what power worked ?.....  
 (c) Maker's name ?  
 .....  
 (d) Plungers or Rams :—Diameter.....Number.....  
 Single or double acting.....Length of stroke.....  
 (e) Steam Cylinders :—Diameter.....Number.....

(f) From what source does the Pump draw its water?.....

(g) Diameter of:—Suction pipe.....Delivery pipe.....  
.....Pipe to sprinkler service.....

(h) State for what Purposes, if any, the pump is used other than to supply the sprinkler installation.....

(i) Is sufficient power to drive the Pump at an efficient pressure available at all times throughout the year?.....

(j) What is the minimum steam pressure maintained?.....

(k) Where is the Pump connected with the installation?.....

(l) If the pump is not of the Plunger or Ram type state why, and append full description and output in gallons per minute.....  
.....  
.....

(m) Is it Automatic? If so—  
 (1) Is it kept constantly moving under steam?.....  
 (2) Has it a flywheel?.....  
 (3) At what pressure is the Automatic Regulator set to operate?.....  
.....  
 (4) Is there a full-sized by-pass steam pipe round the Automatic Valve?.....  
.....  
 (5) If the water is below the level of the pump, is there a foot valve and an efficient "priming" arrangement?.....  
 (6) Is there a minimum steam pressure of 60 lbs. available at all times throughout the year?.....  
 (7) Is there a stop valve on the pipe which connects the pump with the Sprinkler Installation?.....

**Gauges.**

(a) How many Gauges are there, and where fixed?.....

(b) State pressure indicated at time of survey by each Gauge—  
 Before sounding Alarm. After sounding Alarm.  
 (1) Above Alarm Valve.....lbs. ....lbs  
 (2) Below Main Stop Valve.....lbs. ....lbs  
 (3) On branch from Town's Main, Automatic Pump.  
 or Hydraulic Injector Apparatus, as the case may be  
.....lbs. ....lbs.  
 (4) On level of the highest Sprinkler (if one provided).....lbs. ....lbs  
 (5) Any other Gauge (state its position).....lbs. ....lbs  
 State distance in height between the highest Sprinkler and installation gauges .....

*N. B.—When the supplies consist of two separate Town's Mains, particulars of gauges on both Mains must be given.*

**Valves.**

- (a) Describe the position of the Main Stop Valve.....
- (b) When closed, does it shut off all supply of water to the Sprinkler service ?  
.....
- (c) Is it readily accessible to authorised persons ?.....(d) Is it secured open by riveted or padlocked strap ?.....
- (e) Describe the position of the Alarm and/or Air Valves.....
- (f) Are they, together with the Main Stop Valve, protected from the action of frost ?.....if so, how ?.....
- (g) Give full particulars of any subsidiary Stop Valves or Shut-off Cocks and how they are secured.....  
.....
- (h) Is each supply pipe fitted with a Back Pressure Valve and where are they situated ?.....
- (i) If the Water Supplies consist of two Towns' Mains, are the Back Pressure Valves fixed on the two connections close up to the wall of the Sprinklered Building and close to the Main Stop Valve ?.....  
.....
- (j) If one of the Supplies is an Elevated Tank or Private Reservoir, is the Back Pressure Valve fixed not less than 15 ft. below the base of such Tank or Reservoir ?.....

**Pipes.**

- (a) What is the greatest number of Sprinklers in any one floor or corresponding floors of Buildings communicating otherwise than by Fire-proof Doors or Shutters ?.....
- (b) Is the diameter, arrangement and load of every Pipe in conformity with the Rules ? .....
- (c) If not, give full particulars.....
- (d) Are any of the pipes on the Installation side of the Main Stop Valve used for any other purpose than to feed the Sprinklers or to test the Alarm ?.....If so, what ?.....

**Alarm.**

- (a) What type.....position of gong.....  
and what protection is provided for (1) gong ?.....  
(2) the turbine ?.....
- (b) Does it act satisfactorily ?.....(c) How often lubricated ?  
.....
- (d) What is the diameter of the Testing-Cock fixed above the ordinary Alarm Valve or Air Valve ?.....

(e) If the Installation is on the alternate wet and dry pipe system—Is there an additional Testing-Cock so fixed that the alarm can be tested weekly when the Installation is on the dry pipe system?.....

(f) Whose duty is it to test, and is it tested weekly, if on the wet or alternate system? .....

**General Information.**

(a) Is any portion of the Installation, including the Tank, liable to be affected by frost?.....

(b) If so, what precautions are taken?.....

(c) Has any accident occurred to the Sprinkler system?.....  
.....If so, give particulars.....

(d) Has any fire occurred since the Installation was completed?.....  
.....If so, give particulars.....

(e) How many spare Sprinkler Heads are always kept on hand?.....

(f) What other Fire Extinguishing Appliances are maintained?.....

(g) Is there a Drencher system?.....

(h) If so, does it draw water from Sprinkler Branch pipe?.....

(i) CORN MILLS. Is every Sprinkler examined at least once a week and dough and other accumulation removed therefrom?

**Surveyor's Opinion.**

As to the Installation generally.....  
.....  
.....

**Certificate.**

The above Installation is in conformity with the Rules in all respect except the following :—

For the.....Insurance Company,  
.....Surveyor.

Date of Survey.....

## APPENDIX V

## QUARTERLY REPORT ON HYDRANT SERVICES AND HAND APPLIANCES.

**NAME OF RISK** .....**SITUATION** .....**DATE** .....**HYDRANT TEST.**

1. What time elapsed after the alarm had been given before :—

	.....Minutes at Hydrant No.....
(a) The first hose jet came into operation	....." " " "
(b) .. second .. .. .. ..	....." " " "
(c) .. third .. .. .. ..	....." " " "
(d) .. fourth .. .. .. ..	....." " " "
(e) .. fifth .. .. .. ..	....." " " "
(f) .. sixth .. .. .. ..	....." " " "

*N. B.—Questions (e) and (f) apply only when there are 40 or more hydrants throughout the premises.*

2. What pressure was maintained on the pump gauge when the above hydrants were fully open ?

3. Were all hose pipes in good condition and complete with the necessary rubber coupling joint rings ?

**MOTIVE POWER.**

4. (a) If by steam, (1) has steam been kept constantly up to the required minimum pressure since the last inspection and (2) what is the lowest steam pressure at any time ?

(1).....(2).....Lbs/[']"

(b) If by electricity, has current been continuously available since last inspection ?

.....

(c) If by petrol engine (1) is the engine tested at least twice per week and (2) is a supply of spirit sufficient to drive the engine for about 24 hours kept on hand?

(1)..... (2) .....

**VALVES, ETC.**

5. Where all hydrants, cut-off valves, hose pipes, branch pipes, and nozzles found in good working order, and the last three items complete according to the Association's requirements?

.....

*N. B.—Premises having underground hydrants must also state if the number of stand-pipes found in place corresponds to the approved figure.*

/

6. What quantity of spare hose was in stock at date of inspection?

.....

7. How many spare rubber coupling joint rings are kept in stock; and in what manner are they stored in order to prevent deterioration?

.....

**HAND APPLIANCES.**

8. Were all buckets found full of water?

.....

*N. B.—Buckets installed for use with electrical gear must be filled with sand and a reply above in the affirmative will be taken as meaning that such buckets were found in a full condition.*

9. State if all chemical extinguishers are maintained in a **Clean** and efficient condition. How many spare charges for these machines were in stock at date of inspection?

.....

**GENERAL.**

10. Since last report:—

(a) Have any alterations, repairs or replacements been made to the service?

If so, give full details.

.....

.....

.....

(b) Has the service been inoperative for any period?

If so, state how long and the reason for this.

.....

.....

.....

(c) Has any outbreak of fire occurred?

If so, give particulars of Fire Extinguishing Appliances used to quell the outbreak.

.....

.....

.....

**Remarks and/or Recommendations.****Surveyor's Signature.....**

## APPENDIX VI

## QUARTERLY REPORT ON AUTOMATIC SPRINKLER INSTALLATIONS AND HAND FIRE EXTINGUISHING APPLIANCES.

**NAME OF RISK**.....**SITUATION**.....**DATE**.....

## SPRINKLER INSTALLATION.

## (a) PRESSURES.

Inspect all gauges and state below the pressures above and below the alarm valves.

Installation No. 1	$\left\{ \begin{array}{l} \text{above ..... lbs.} \\ \text{below ..... lbs.} \end{array} \right.$
" " 2	$\left\{ \begin{array}{l} \text{above ..... lbs.} \\ \text{below ..... lbs.} \end{array} \right.$
" " 3	$\left\{ \begin{array}{l} \text{above ..... lbs.} \\ \text{below ..... lbs.} \end{array} \right.$
" " 4	$\left\{ \begin{array}{l} \text{above ..... lbs.} \\ \text{below ..... lbs.} \end{array} \right.$

## (b) VALVES AND ALARMS.

- Where all installation stop valves and the  $\frac{1}{2}$ " cocks on the pipes leading to the alarms found open?.....
- Give the time taken for an alarm to sound after opening a  $\frac{1}{2}$ " testing valve. ....minutes, at installation No.....

## (c) PUMP.

If of the automatic starting type:—

- State the time taken for the pump to start after opening the  $\frac{1}{2}$ " testing valve. ....minutes at installation No.....
- With any one of the Installation's 2" drain valves open, state the pressure maintained by the pump. ....Lbs/[ ]" at installation No.....

(iii) If the pump is non-automatic, did it work satisfactorily when brought into action ? State delivery pressure maintained .....Lbs/[ ]" at Installation No.....

**Note.**—In order that the alarm(s) may now be tested with only overhead tank pressure the pump must not be allowed to come into action by the automatic starting gear. In the case of steam pumps the steam stop valves must be closed and with pumps having electrical starters the switch should be tied up.

(iv) Again open a 2" Installation drain valve and state lowest running pressure maintained.  
.....Lb/[ ]".....

(v) Did the alarm work satisfactorily at this pressure ?  
.....

(vi) State if the tank from which the pump takes its supply is full. If not, give the approximate quantity of water available for the pump.  
.....

**(d) ELEVATED TANK.**

I. (a) Is the tank filled with as clean water as possible ?  
.....

(b) When was it last cleaned ?  
.....

(c) Is the indicator in order ?  
.....

II. In the case of Air Pressure Tanks :—

(a) State depth of water indicated on gauge glass, e.g.,  $\frac{1}{3}$ ,  $\frac{1}{2}$  or  $\frac{2}{3}$  as the case may be.  
.....

III. (b) What is the actual pressure maintained ?  
.....

IV. Is the air and water pump in good working order ?  
.....

**(e) HAND APPLIANCES.**

I. Were all buckets found full of water ?  
.....

*N. B.—Buckets installed for use with electrical gear must be filled with sand and a reply above in the affirmative will be taken as meaning that such buckets were full.*

II. State if all chemical extinguishers are maintained in a *clean* and efficient conditions. How many spare charges for these machines were in stock on date of this report ?

.....

**(f) GENERAL.**

I. How many spare sprinkler heads were in stock on date of this report ?

.....

II. Since last report :—

(a) Have any alterations, repairs or replacements been made to the various installations ? If so, give full details

.....

.....

(b) Have any of the installations been inoperative for any period ? If so, state for how long and the reason.

.....

.....

(c) Has any outbreak of fire occurred ? If so, give particulars of Fire Extinguishing Appliances operated.

.....

.....

III. Give full details if any additional buildings have been erected communicating with the Sprinkler-fitted buildings, or if any structural alterations have been made which affect the Sprinkler Installation in any way.

.....

.....

.....

---

**Remarks and/or Recommendation.**

*Surveyor's Signature.....*

## APPENDIX VII.

CONDITIONS RELATING TO THE USE OF PETROL  
OR MOTOR SPIRIT ENGINES FOR DRIVING PUMPS.

1. The engine must be fixed in an easily accessible position where it will not be liable to be damaged by fire or any other cause.

2. The engine room must be artificially heated, if necessary so as to prevent the temperature falling below 40° at any time.

NOTE 1. Low pressure hot water, steam or hot air apparatus or electric radiators only must be used. If electric radiators are used full particulars of the type and name of the maker must be furnished.

NOTE 2. Incandescent electric lighting must be used for the engine house. Naked lights are not permissible.

NOTE 3. Switches in connection with electric lighting or heating should, if possible, be located outside the engine room, but if this is not practicable they must be of a gas tight type. Wall plugs must not be used in the engine room.

3. The engine must be fitted with dual ignition (magneto and accumulator with coil with separate sparking plugs to each) which must be so arranged that the engine can be worked on either ignition independently.

4. The magneto must be of the high tension type.

5. A small voltmeter must be provided and so arranged that the voltage of the accumulator or battery can be ascertained at will.

6. Except in cases where an independent electric supply is readily available the engine must be fitted with and work a small low voltage dynamo from which the accumulator can be re-charged when necessary while the engine is running on the magneto.

7. The conductors from the magneto and accumulator to the sparking plugs must be run in metal tubes to protect them against injury.

8. The opening to the atmosphere from the induction pipe must be fitted with a flame trap.

9. The engine must be governor controlled.

10. The following spare parts must be kept:—

- 1 complete set of piston rings for each cylinder;
- 2 high tension sparking plugs for each cylinder;
- 2 valves suitable for inlet or exhaust complete with springs, cotters and washers;
- 1 complete filter for petrol pump feed with cork gasket;
- 2 springs for each fitted;
- 1 complete set of cylinder head and other gaskets.

11. In the case of a sprinkler pump the engine must be of the automatic starting type and where the engine operates a hydrant pump it must be so arranged that it can be readily started by one person.

12. The petrol or motor spirit tank from which the engine is fed must be fitted with a gauge glass or other suitable indicator (which must be protected against mechanical injury) showing the quantity of spirit contained therein. The tank must have a holding capacity sufficient to run the engine at full load for at least six hours.

NOTE.—All joints in the petrol piping must be brazed.

13. There must be kept on hand at all times sufficient petrol or motor spirit to run the engine at full load for about 24 hours.

14. The reserve supply of petrol or motor spirit must be stored in a safe position, away from the engine house.

15. Petrol or motor spirit only must be used, the use of other substances such as for example, paraffin, not being allowed.

16. The Insured shall give a written declaration that the following conditions will be strictly complied with:—

- (a) To test the engine at least twice a week;
- (b) To maintain the temperature of the engine room at not less than 40°F. at all times.
- (c) To maintain in a safe position, away from the engine house, the minimum quantity of motor spirit required by these Rules (see Rule 13).
- (d) To use motor spirit only for driving the engine; and
- (e) To keep on hand the spare parts required by these Rules (see Rule 10).

**APPENDIX VIII****CONDITIONS RELATING TO THE USE OF COMPRESSION.  
IGNITION TYPE ENGINES FOR DRIVING PUMPS.**

1. The engine must be of the cold-starting airless-injection type and be fixed in an easily accessible position where it will not be liable to be damaged by fire or any other cause.

2. (a) The engine room must be artificially heated if necessary, so as to prevent the temperature falling below 40°F

(b) Where any of the auxiliary equipment (see Item 3 (c) infra) uses petrol as a fuel, the following requirements shall, on account of the greater fire hazard, apply regarding the heating and lighting of the engine room, viz :—

- (i) Low pressure hot water, steam or hot air apparatus or electric radiators only may be used. If electric radiators are used, full particulars of the type and the maker must be furnished.
- (ii) It is recommended that incandescent electric lighting be used. Naked lights must not be used.
- (iii) Switches in connection with electric lighting or heating should, if possible, be located outside the engine room, but if this is not practicable they must be of a gas tight type. Wall plugs must not be used.

3. (a) The engine must be so arranged that it can be readily and immediately started by one person without the necessity of having to carry out any preliminary heating of the engine cylinders or combustion chambers (e.g., by wicks, cartridges, heater plugs, etc.).

(b) If a manual-starting engine is used, the controls of the decompressing device or other mechanism which has to be operated in the starting process must be within easy reach of the operator when turning the starting crank handle.

(c) If the engine is to be started by an electric starting motor, the motor must be of adequate size and batteries of ample capacity must be provided.

The batteries must be kept fully charged at all times and must not be used for any other purpose.

A voltmeter must be provided and so arranged that the voltage of the batteries can be ascertained at will, and a hydrometer must be provided for testing the specific gravity of the battery electrolyte.

At no time must the battery be disconnected so that it is not available to start the engine, and suitable arrangements must be made accordingly for the charging of the battery in position. If an electric light or power supply is not available, arrange-

ments must be made to charge the battery from a separate charging set driven by a petrol engine or by other satisfactory means.

4. The engine must be fitted with a governor capable of controlling the engine speed under all conditions of load.

5. A suitable metallic screen must be fitted to prevent foreign matter entering the air inlet passage to the engine.

6. (a) The fuel supply tank must be constructed of lead-coated steel and must contain sufficient fuel oil for a six-hours full load run. The outlet from the tank must be at a height of not less than 2 feet above the inlet to the fuel injection pump on the engine and the pipe line must follow a continuously downward gradient.

(b) A suitable dual level indicator must be provided and protected against mechanical injury.

(c) The outlet from the tank to the engine must be so arranged that sludge and sediment can settle in the tank without passing down the feed pipe to the engine. A sump must be provided in the base of the tank and fitted with a drain plug. For cleaning purposes on opening in the tank of not less than 3 inches diameter must be provided.

(d) No valves or cocks are permitted in the pipe between the tank and the engine.

(e) All pipe joints must be brazed or welded.

(f) A filter must be fitted in the pipe line from the tank to the engine in addition to other filters incorporated in the fuel system. The fuel must be cleaned either in this filter, or subsequently so thoroughly that it will not be possible for any foreign matter to reach the fuel pump sprayers or injectors to cause an obstruction. Precautions must be taken to prevent any air-locks in any part of the pipe work, fuel pump, sprayers or injectors and filter system. No air relief cocks are permitted, and where air relief is essential, screwed plugs must be used. The entire fuel system from the tank to the sprayers or injectors must be provided with means for the maintenance of a completely primed condition free from air-lock.

7. After dismantling for cleaning, etc., the necessary precautions must be taken to ensure that the entire fuel system is completely filled with oil and free from air-lock.

8. In any method of stopping the engine, such as cutting off the fuel supply, etc., the mechanism must be such that it is automatically restored to the starting position after use.

9. The THERMO-SYPHON system of cooling must NOT be used. The engine cooling water must be obtained from the fire pump and after passing through the engine, the outlet water must be run to waste through a pipe placed well above the top of the engine water jackets or above the level of the top of the pump priming tank if one is fitted.

10. Adequate means must be provided for the efficient cooling of the engine lubricating oil when the engine is running. The oil used must have the necessary fluidity at the lowest permissible room temperature (40°F.).

11. The fuel oil to be used must be of the quality specified by the engine maker to give immediate starting and for the performance required.

12. The following spare parts must be kept readily to hand :—

- 2 Sprayers or injectors complete.
- 1 complete set of piston rings for each cylinder.
- 1 Inlet valve complete.
- 1 Exhaust valve complete.
- 2 Springs for each spring used in the engine.
- 1 complete set of engine packings, i.e., cylinder head gas-ket, crank-case gas-ket, etc.,
- 1 set of fuel oil filter elements.
- 1 set of lubricating oil filter elements.

13. Any special tools supplied by the engine maker must be kept readily available in the engine room.

14. There must be kept on hand at all times sufficient fuel oil to run the engine at full load for 24 hours.

15. The Insured shall give a written declaration that the following conditions will be strictly complied with :—

- (a) To test the engine at least twice a week.
- (b) To maintain the temperature of the engine room at not less than 40°F. at all times
- (c) To maintain the minimum quantity of fuel oil required by these Rules (see Rule 14).
- (d) To use a good grade of fuel oil equal to the quality specified by the engine maker.
- (e) To keep on hand the spare parts required by these Rules (see Rule 12)

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## APPENDIX IX

Table showing pressures of water in pounds per square inch for every foot in height up to 100 feet.

Height in feet.	Pressure in pounds per square inch.	Height in feet.	Pressure in pounds per square inch.	Height in feet.	Pressure in pounds per square inch.	Height in feet.	Pressure in pounds per square inch.	Height in feet.	Pressure in pounds per square inch.
1	0.43	21	9.09	41	17.75	61	26.42	81	35.08
2	0.86	22	9.53	42	18.19	62	26.85	82	35.52
3	1.30	23	9.96	43	18.62	63	27.29	83	35.95
4	1.73	24	10.39	44	19.05	64	27.72	84	36.39
5	2.16	25	10.82	45	19.49	65	28.15	85	36.82
6	2.59	26	11.26	46	19.92	66	28.58	86	37.25
7	3.03	27	11.69	47	20.35	67	29.02	87	37.68
8	3.46	28	12.12	48	20.79	68	29.45	88	38.12
9	3.89	29	12.55	49	21.22	69	29.88	89	38.55
10	4.33	30	12.99	50	21.65	70	30.32	90	38.98
11	4.76	31	13.42	51	22.09	71	30.73	91	39.42
12	5.20	32	13.86	52	22.52	72	31.18	92	39.85
13	5.63	33	14.29	53	22.95	73	31.62	93	40.28
14	6.06	34	14.72	54	23.39	74	32.05	94	40.72
15	6.49	35	15.16	55	23.82	75	32.48	95	41.15
16	6.93	36	15.59	56	24.26	76	32.92	96	41.58
17	7.36	37	16.02	57	24.69	77	33.35	97	42.01
18	7.79	38	16.45	58	25.12	78	33.78	98	42.45
19	8.22	39	16.89	59	25.55	79	34.21	99	42.88
20	8.66	40	17.32	60	25.99	80	34.65	100	43.31

**Note:**—In applying this table the height of the highest sprinkler above the pressure gauge must be ascertained and the pressure to be allowed for such height will be obtained by reference to the table; for example, if the gauge records a pressure of 60 lb., and the highest sprinkler is 67 feet above the gauge, there will be a pressure of say 31 lb. on the highest sprinkler.



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